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CANADIAN GEOGRAPHICAL JOURNAL

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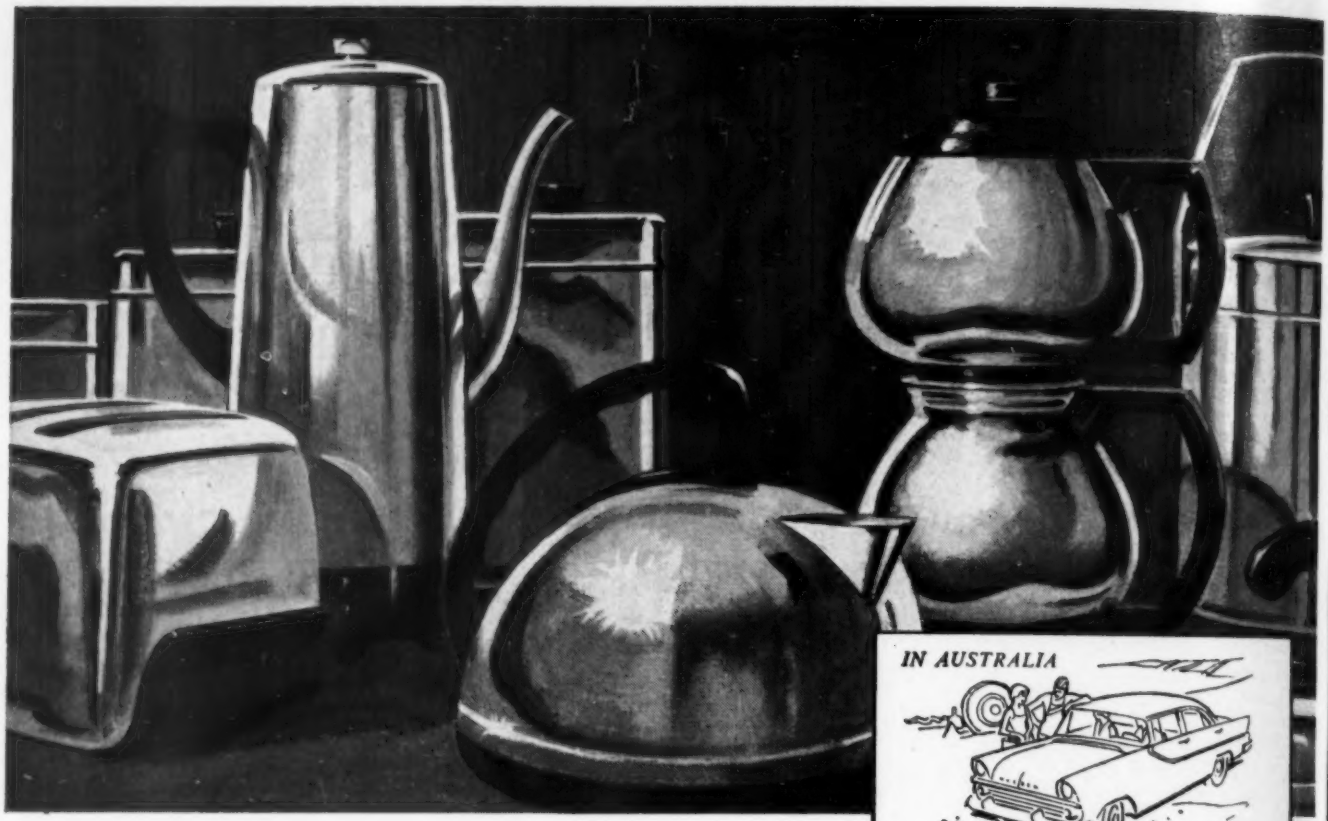

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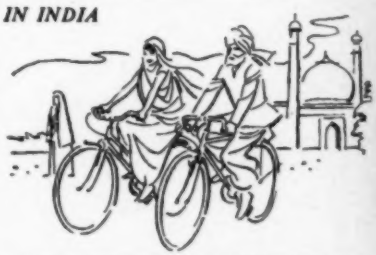

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Encroaching sand, dead trees, and stunted bushes combine to form an abstract pattern against clouds at Picton, Ontario. D. L. McQueen

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Editor - WILLIAM J. MEGILL

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The articles in this Journal are indexed in the *International Index to Periodicals* and in the *Canadian Index.*

The British standard of spelling is adopted substantially as used by the Government of Canada and taught in most Canadian schools, the precise authority being the Concise Oxford Dictionary, fourth edition, 1951.

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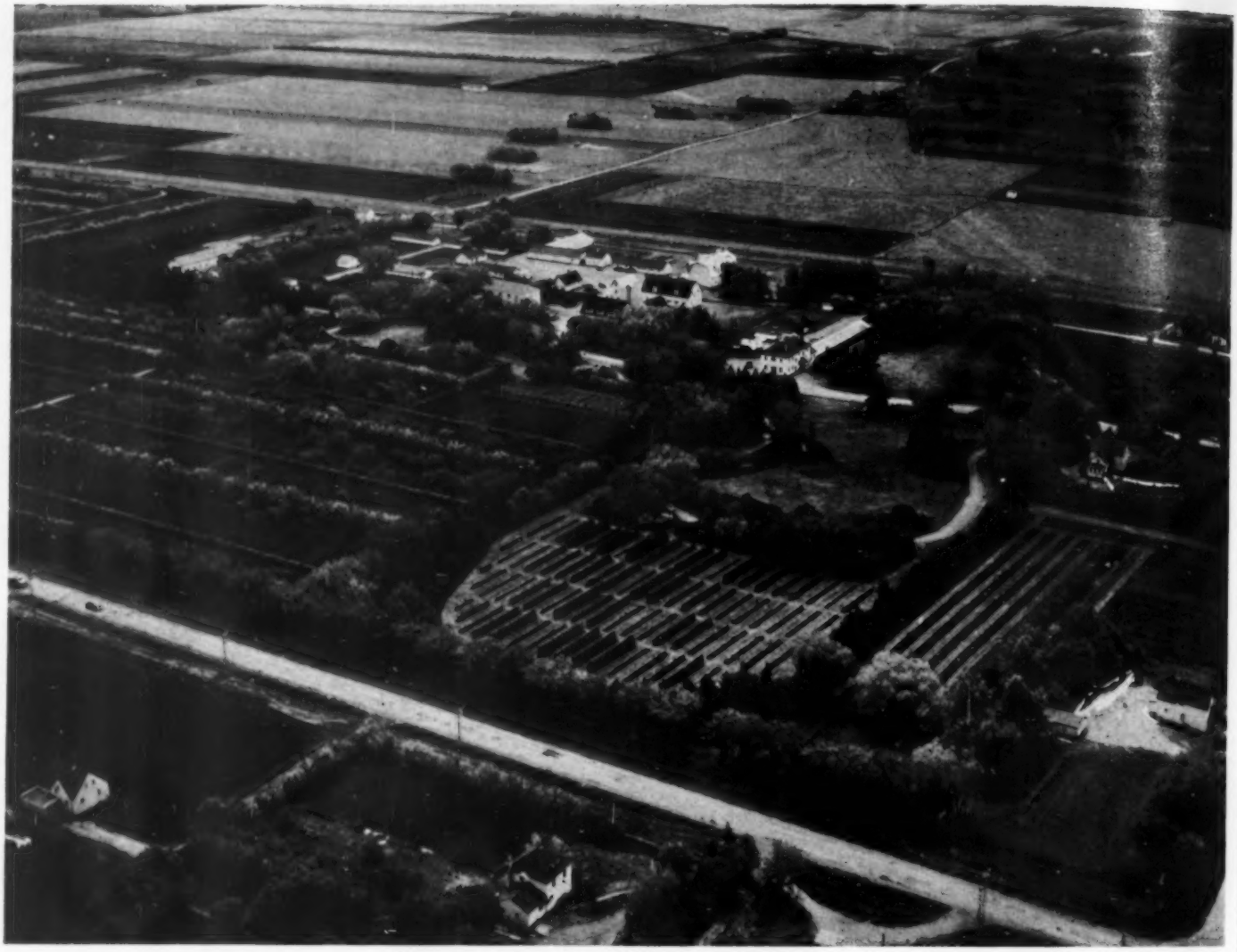


The Experimental Farm at Morden, Manitoba. R.C.A.F.

The Pembina Pocket

Manitoba's Garden Spot

by W. R. LESLIE

Photographs by the Manitoba Department of Industry and Commerce unless credited

BENEATH the Pembina Hills in south central Manitoba, the Pembina Triangle, a flat grassy plain, stretches eastward to the Red River, a distance of thirty to forty miles. In reality, this area is not a triangle at all, but a pocket, inverted with its northern portion rounded and tilted off to westward. The western side of the pocket is flanked by the Pembina Hills escarpment. The United States-Canadian border forms the base. The east is indefinite, its outline being marked where the soils are fine, 'heavy' clay in texture. Even less clearly defined is the northern line, which is marked in the sketch as taking in portions of the municipalities of Thompson and Roland immediately north of Stanley and Rhineland.

The story of its formation begins somewhat less than ten thousand years ago when the last ice age came to an end. For a considerable time surface waters drained off to the south and reached the Gulf of Mexico through the Mississippi River channel by way of the Minnesota River. As the vast ice sheet melted, a passage opened up to the east and for an era the run-off was down the Great Lakes to the Gulf of St. Lawrence. Finally, the mass of ice withered, allowing

The writer extends thanks to the kind people who have made facts and illustrations available. Special appreciation is expressed to Professor J. H. Ellis, Dr. J. W. Morrison, Messrs. A. Dack, E. T. Howe, D. K. Friesen, H. G. Riesen, and the Manitoba Department of Industry and Commerce.

surface waters to flow north to Hudson Bay in the mighty Nelson River. Lake Agassiz shrunk leaving only its remnants — Lakes Winnipeg, Manitoba and Winnipegosis.

Nutritious grasses thrived and bison, the American buffalo, became legion, pasturing the whole district. The shaggy creatures found congenial wintering grounds in the richly-grassed, deep, well-sheltered valleys and ravines along the winding Pembina River. American Indians dwelt in the hills and hunted over the plains. The plenitude of arrowheads, skinning tools, and stone axes still being recovered bears evidence that the region was peopled by many redmen and for a very long time.

The Pembina Hills have possessed a series of Indian civilizations. The Mound Builders were followed by Crees, Assiniboines, and Sioux. The several Indian mounds, which were used for ceremonials, worship, and a place to bury their honoured citizens, have yielded many interesting artifacts.

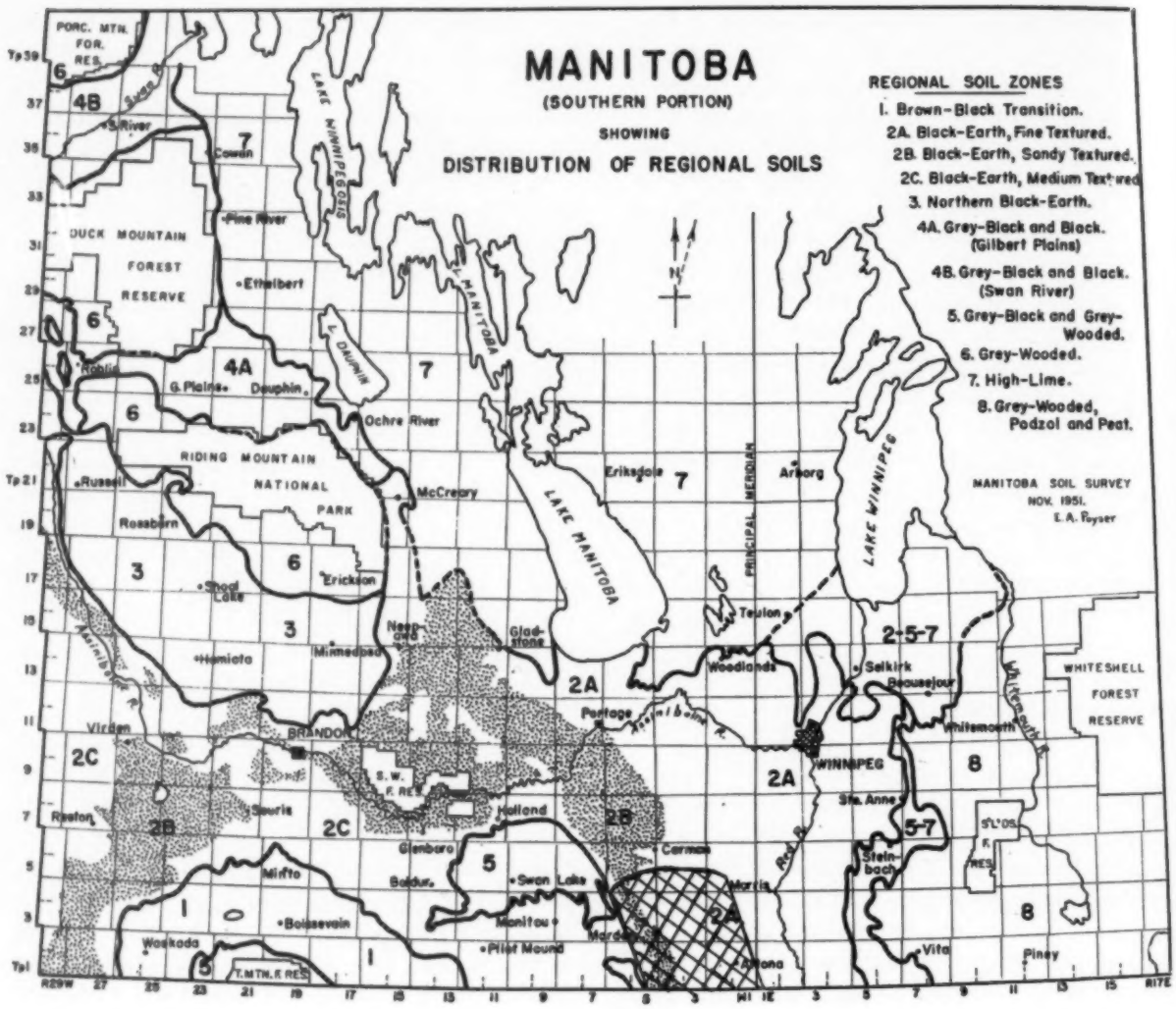
The word Pembina itself is white man's combination of two Cree words, "pemba" and "weemina", meaning summer-berry. The Crees called the *Viburnum trilobum*, commonly known as American Cranberrrybush or Highbush Cranberry, "Pemba-weemina" because the shining, bright-red fruits, clinging to the twigs throughout the depth of winter, were accepted as assurance that summer was coming. Pembinas are scattered abundantly throughout the hills and along the Pembina River, which takes its rise in the Turtle Mountains, southwest of Killarney.

In time, fur traders came from the east and the south. The generous populations of buffalo, elk, moose, deer, bear, beaver, otter and mink gradually dwindled, many to the point of extinction. Then came waves of white settlers. Cattle and other domestic animals replaced the buffalo and deer on the meadowlands and in the valleys. Horses and oxen transported white man where the redman for centuries had trod his trails on moccasins. The aborigines moved away from the scene as the pale-face newcomers began changing the appearance of the country by turning the grass upside down with the plow.

The very first whites to explore the territory were Pierre Gaultier, Sieur de la Vérendrye, and his helpers. In 1738 they passed through the Pembinas on their way to the land of the Mandans along the Missouri River.

Pembina, North Dakota, a mile south of the border, situated close to where the Pembina River empties into the Red River near Emerson, Manitoba, became the first centre of fur trading in the zone. Alexander Henry, Jr., was the first superintendent of the Northwest Trading Company at Fort Pembina, headquarters for the district. During the winter of 1801-02 he instructed his workmen to build a "new kind of a cart". The result was the birth of "Red River Cart" which was

A field of sorghum, a new crop of several uses. This field is being cut to supplement summer pasture for dairy cows.



to play such an important role in prairie transportation during the next seventy years or so. A number of the novel vehicles were directed to go to "Pinancewaywining", the creek that flows out of the Pembina Hills above Morden. The carts took in supplies and carried back furs and buffalo meat and hides.

So, it was that in September 1802 the first Red River carts to be used in Manitoba arrived at Fort Pinancewaywining. White men had now come to live in the Pembina Pocket. In 1803 Henry states concerning an improved form of his Red River cart that "this invention is worth 4 horses to us as it would require 5 horses to carry as much on their backs as one will drag in each of these large carts".

The first considerable influx of settlers came in 1874. The people crossed the grassy plains of the Red River Valley plain, much of which was poorly-drained and marshy. These pioneers sought land along the creeks so that they would have wood and shelter as well as an ample supply of water. That year A. P. "Sandy" Stevenson, later to be heralded appreciatively as the "Apple King of Manitoba", with three fellow Scots, the Duncans, walked in from Winnipeg, a distance of about 75 miles. They selected choice land along Tobacco Creek. All four contributed substantially to the district. Stevenson became an outstanding and stimulating leader. He planted orchards of tree fruits, roses, evergreen groves, and landscaped his farmstead so that to this day it remains one of the most admired beauty spots in the prairie provinces.

Mr. Stevenson's memory is happily perpetuated by the Manitoba Horticultural Association which periodically presents a deserving individual with an "A. P. Stevenson Memorial Gold Medal". The award is made

on basis of conspicuous achievement in the improvement of hardy plants. Since the first award to Dr. Frank L. Skinner, Dropmore, Manitoba, in 1932, nine other plant breeders have been honoured. Three of the awards have gone to plantsmen in the United States; one each to Ontario, Saskatchewan, and Alberta; and four to Manitobans.

Home-seekers from eastern Canada, Great Britain, and United States passed over the marshy plain with its reeds and tall grasses. They headed for the higher rolling lands to the west. There they gained satisfaction with acceptable water, wood for fuel, building, fences, and shelter.

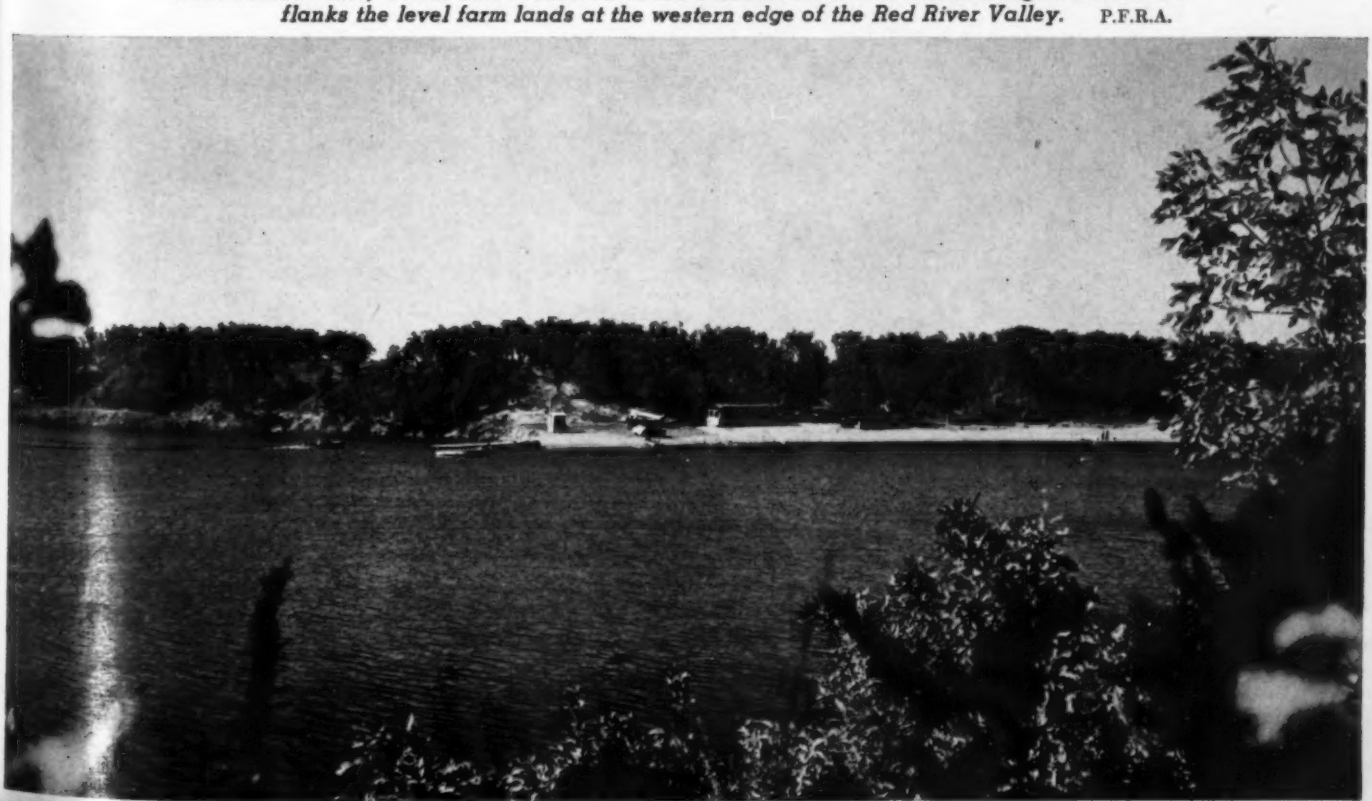
The Pembina Pocket, in large part, had to await the arrival of a new people, the Mennonites* from Russia, for occupation. These immigrants came from the steppes and were accustomed to level plains. In the three years, 1874, '75 and '76, Mennonites to the number of 6,140 arrived in Manitoba. They settled on two "reserves", meaning contiguous tracts of land set aside by the Canadian Government for exclusive occupation of a homogeneous group of settlers. The reserve east of the Red River was taken up first but the western reserve in Rhineland and Stanley, with its deeper, black soil, soon became fully occupied.

The "Pembina Pocket" is only a relatively small part of the flat expanse of plain which is locally referred to as the "Red River Valley". The Altona and the Almasippi soils are the most extensive in acreage and are developed on light to medium-textured lacustrine and delta sands. The Altona soils are light-textured blackearths developed under good surface drainage conditions, but the Almasippi soils are meadow prairie and meadow soils developed on sandy deposits with imperfect drainage. The Morden soils are a somewhat immature type of blackearths developed on drab clay overwash. All of them require careful handling, in the Altona and Almasippi areas to prevent erosion, and in the Morden and Gretna areas because the relatively heavy-textured soil has underlying saline strata.

The low altitude, coupled with the protective Pembina Hills on the west, provide a significantly longer and warmer growing season than is general on the Canadian prairies. The average frost-free period is 122 days and, with 28°F accepted as a "killing frost", the average useful growing season is 142 days. Precipitation averages 20.6 inches, of which one-quarter falls as snow. These factors, and the dark loamy soil, make the Pembina

*Industrious, thrifty, home-loving, widely-talented and particularly gifted in use of machinery, the Mennonites have contributed greatly to the development of Prairie Canada. Their story is well told in the book *In Search of Utopia: The Mennonite in Canada*, by Dr. E. K. Francis, published by D. W. Friesen & Sons Ltd., Altona, Manitoba, 1955.

Lake Minnewasta, a man-made reservoir in the Pembina hills. The eastern edge of the lake flanks the level farm lands at the western edge of the Red River Valley. P.F.R.A.



A newly-developed seedling apple tree at the Morden Experimental Farm.

A crop of soybeans at the Experimental Farm. Soybean oil has many industrial as well as food uses.

Pocket favourable for growing hot-weather and long-season crops.

Until 1916 the agriculture of the area differed little from the rest of the Manitoba southern prairies. Farm income came mostly from cereal grains, livestock and poultry. True it is that living was somewhat more gracious than farther north and west in that most farms possessed the blessings of tree shelterbelts. Many had small plantings of orchard and berry fruits for household use.

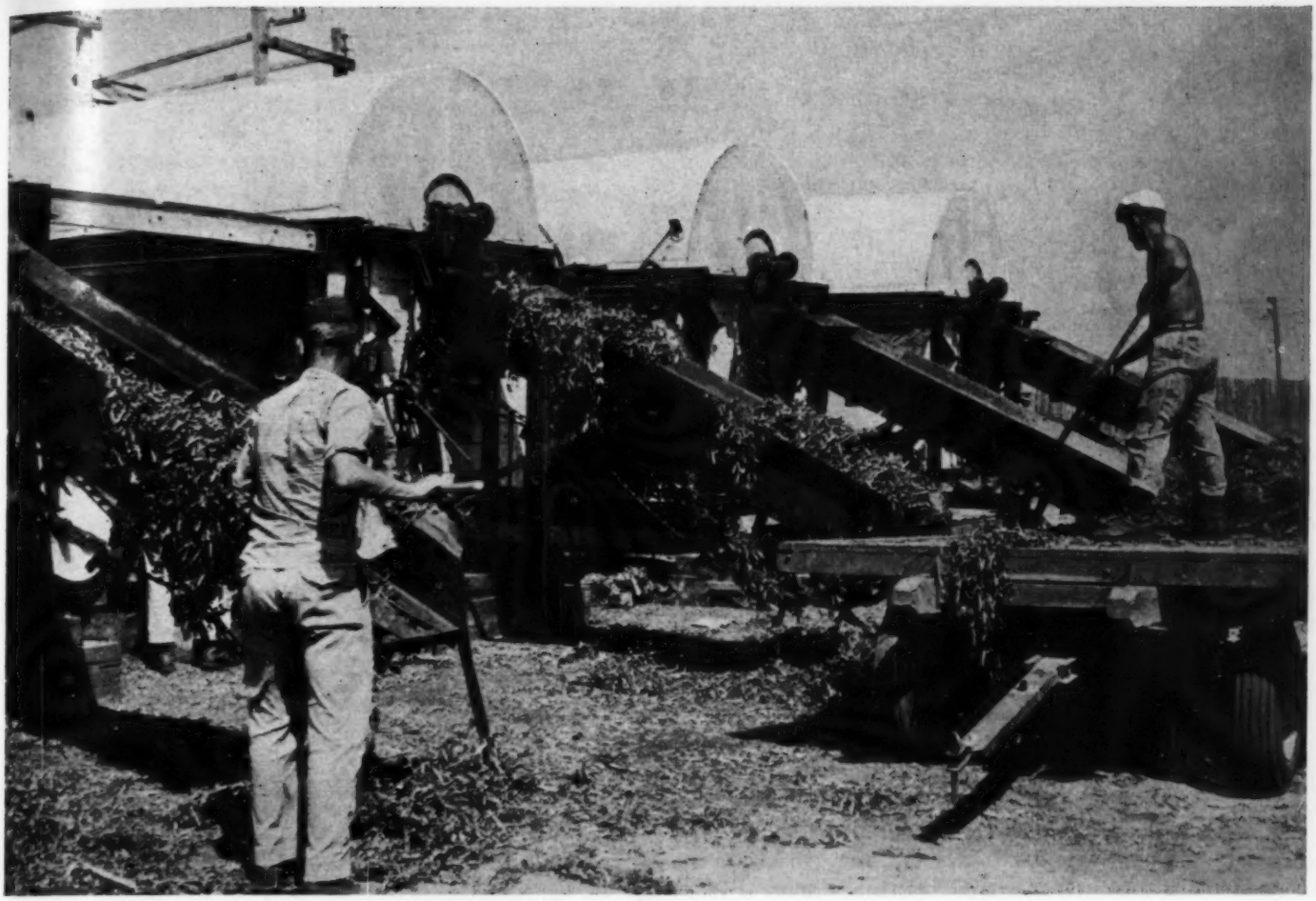
A move for advancement came in 1914 when the Canada Department of Agriculture purchased a piece of land, 300 acres in extent, to be known as the Morden Experimental Station. Its first purpose was to assist homemakers with orchard and garden activities. A secondary program was to explore the range of field crops that might be profitably adapted to the western part of the Red River Valley.

It is serving its function in impressive manner. It has led the way in establishing to a firm position such field crops as: corn for grain, sunflowers for oil, sugar beets, soybeans, field beans, peas, rape seed, sorghum, and various legumes. Not only was the suitability of these crops proven by demonstration, but valuable new varieties of corn and sunflowers have been bred and introduced to an appreciative public. Research effort stresses sunflowers and corn.

The original name, Experimental Station, was recently changed to Experimental Farm. Through the years, more land has been acquired, bringing the holding to about 626 acres.

The selection of the Morden district as the site was inspired by the stirring example of A. P. Stevenson. He had developed an orchard of seventeen acres and was renowned far and wide for his bountiful crops of apples, plums and cherries. He had named and introduced some excellent seedling apples and plums. From his nursery, stock of hardy tree fruits and ornamental shrubs was disseminated across the prairies.

Horticulture has rightfully held first place from the start. Because home-making is the foundation of successful living in all countries, the task accorded the Experimental Station was that of leading the way in increasing the beauty, fruitfulness and comfort of prairie home grounds. Effort expanded until now about 250 acres of land are occupied by



Viner machines shelling peas for canning.

garden crops. Fruit plantations cover about 150 acres. Vegetables and specialized gardens are extensive. The arboretum of about fifty acres contains an astonishingly diverse range of native and exotic woody plants. It is treasured by nurserymen and landscape gardeners. The large ornamental grounds attract and delight thousands of visitors each year.

The plant breeders have been outstandingly successful as is confirmed by the introduction of over eighty new varieties of fruits, vegetables, ornamental trees and perennial plants since 1929. The large, well-equipped Fruit and Vegetable Processing Laboratory has rendered valuable help to canning factories and to home-makers as well as giving sound appraisal of the comparative virtues of different fruits and vegetables.

Apricots developed from seed imported from Manchuria have been productive and make available another dessert fruit heretofore little known. American black walnuts from Minnesota, butternuts from northern Ontario, pears from Manchuria, and Mongolian cherries (*Prunus fruticosa*) from the northern Orient are useful additions. The last named, received in seed form from Russia, are "pony-sized" bushes that bear sizeable morello-type cherries. The little bushes come into bearing early and have never failed to yield a crop. A jelly of superlative quality and flavour is made from the red fruit.

A noteworthy chore performed is that of establishing groves of hardy, thrifty sugar maple, Canada's national "floral" emblem. The sources were northern Minnesota and nearby regions of Ontario. Seeds produced at Morden are distributed to nurserymen to make a supply of trees available to the public. Thus Canadian Maple trees are becoming a part of prairie home grounds, a condition greatly to be desired.

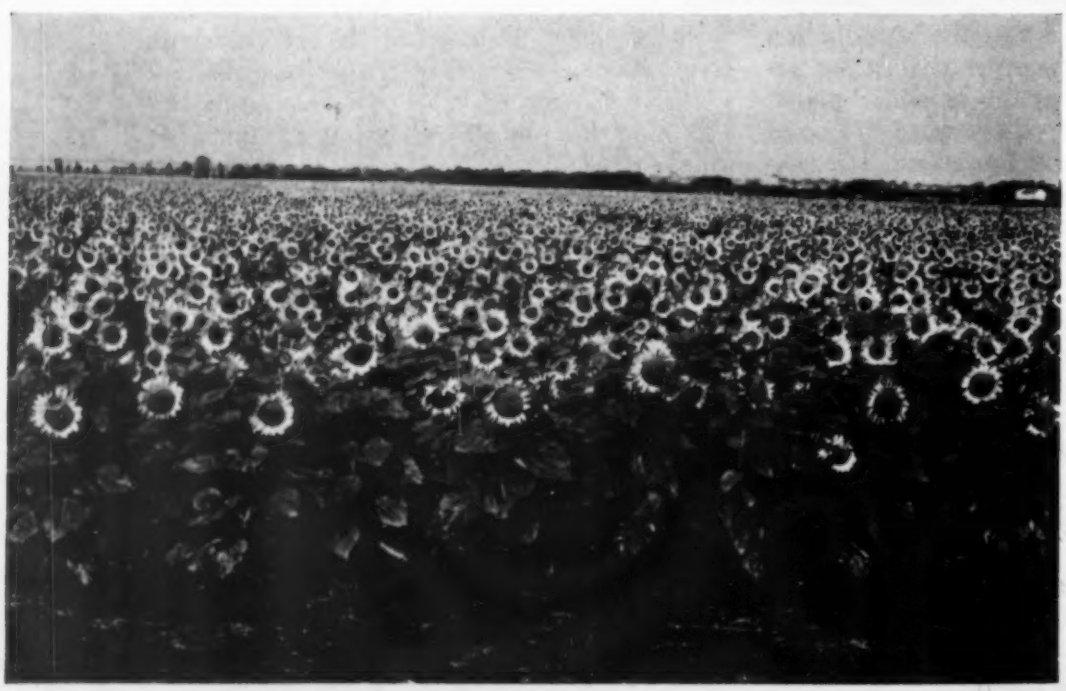
Mennonite settlers who arrived in the mid-seventies brought with them seeds of muskmelons, watermelons, and large-seeded sunflowers which had been cherished crops in Russia. All three have succeeded well. The original strains of melons have been valuable in providing a base of early-maturing strains.

A hedge garden at the Experimental Farm.
Morden Experimental Farm

The cottonwood, a quick-growing tree much used by Mennonite settlers to provide shade and a supply of wood.
Morden Experimental Farm

Crosses made at Experimental Farms between Mennonite and commercial varieties are resulting in improved crops. The sunflower yields seeds which make an acceptable substitute for peanuts, a crop demanding a longer growing season than that which prevails here.

Besides the Farm at Morden, the territory is richly served by the Manitoba Department of Agriculture and Conservation, the University of Manitoba, and the plant pathol-



A field of "Advance" hybrid sunflowers.
Morden Experimental Farm

ogists, entomologists, physiologists, and soil specialists at the Canada Department of Agriculture Research Laboratory on the University grounds.

Although the population of most rural municipalities has declined during the past twenty-five years, the Pembina Pocket, where intensification of agriculture has taken place, has kept its people at a constant level of thirty persons per square mile. This is considerably less than the maximum carrying capacity of the area, and differs sharply from prairie grain-farming districts which have a density of only seven to ten persons per square mile. Water supply is a factor tending to limit future growth but plans for development of storage on the Pembina and Morris rivers should solve this problem.

The introduction of vegetable oil crops, corn, sugar beets, canning crops, and extensive poultry production has strengthened the economy of this region significantly. Practically all of the land in Rhineland, Stanley, Thompson and Roland municipalities is rated as being suitable for special crop production. The stretch of favourable land reaches northward to Carman. There seems to be scope for profitable increase in production of vegetables for processing, raw carrots and onions, potatoes, orchard and berry fruits, poultry, livestock, and dairy products as well as the oil crops — sunflowers, soybeans and rape seed.

Raspberries, strawberries, plums, cherries, apples and saskatoons are presently produced quite successfully. For stabilizing quality and yield, some irrigation is considered necessary. In the opinion of local agronomists, economic production of these fruit crops in southern Manitoba has been successfully demonstrated. Only promotion and development are necessary.

The Pembina Pocket is to Manitoba what the Annapolis Valley is to Nova Scotia, the Niagara Peninsula to Ontario, and the Okanagan Valley to British Columbia, namely, "The Garden Spot".

It has an interesting background and auspicious prospect for a brightly-shining future. Sixty years ago, when Tom Tickner used to startle passengers aboard the train at Morden as he drove up in a vehicle drawn by his team of fast-trotting bull elk, farms produced wheat, oats and cattle. Since then, the scene has been transformed impressively, especially during the past fifteen years when change has come apace. Every farm has the blessing of electric power. Canning factories flourish in Morden and Winkler. A mill at Morden processes flax straw. The Vegetable Oils factory at Altona continues to expand. Diversity of agriculture is now general and to the substantial benefit of the district. It is stirring to witness the natural advantages enjoyed by this section of the one-time buffalo pastures being put to greatening use of its potential.

The canning factory at Morden. Built in 1952, it has brought new prosperity to the district. Peas, beans, and corn are the main items canned, while tomatoes, asparagus, carrots, and beets are canned to a lesser extent.

Geological Survey camp, Belcher Islands, 1958.

Belcher Islands, N.W.T.

by J. L. KIRWAN

Photographs by G. D. Jackson for the Geological Survey of Canada unless credited.

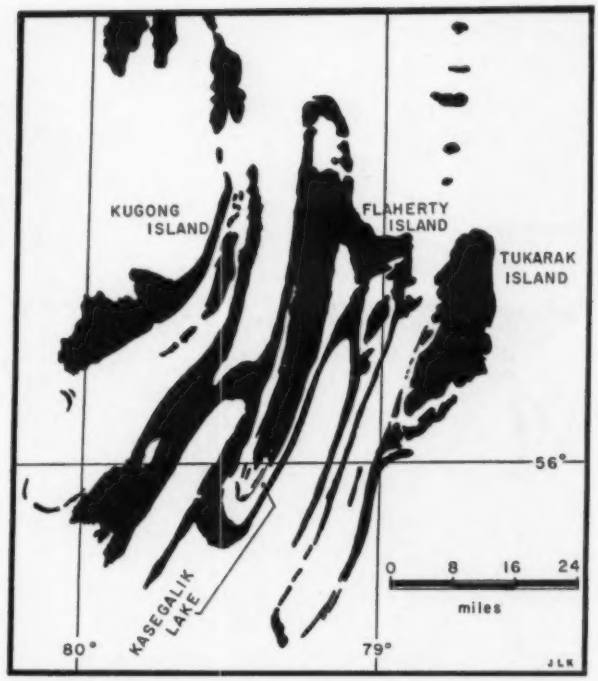
THE BELCHER Islands of southeastern Hudson Bay impress most visitors by their climatic inhospitality. Surrounded in rain-laden fog or clouds for much of the summer, or beset by high winds and driving rain, with low summer temperatures and high relative humidity, these islands present conditions of living very different from those to which most Canadians are accustomed. Rough seas, caused by the high wind which blows at the islands across hundreds of miles of uninterrupted water, and the presence of great packs of drift ice, even in mid summer, make travel to the area by small sea craft risky. Air travel is uncertain because of the presence of fog and clouds on the islands and because of the roughness of the water on which the aircraft must land. But the weather is not all bad, for sometimes the clouds disappear, the wind dies down and the sun shines forth so that it seems like a warm summer's day in Ontario. That is when the analogy is made complete by the appearance of black flies and mosquitoes, which were absent in the colder weather.

These islands are almost completely barren. They are composed of large areas of dark rock and treeless tundra and are dotted with myriad lakes and ponds. Kasegalik Lake, the largest fresh-water lake on the islands, is roughly U-shaped and nearly 70 miles in length from tip to tip. This lake is famous to both the Eskimo and the white man for harbouring the rare fresh water black seal after which it was named.

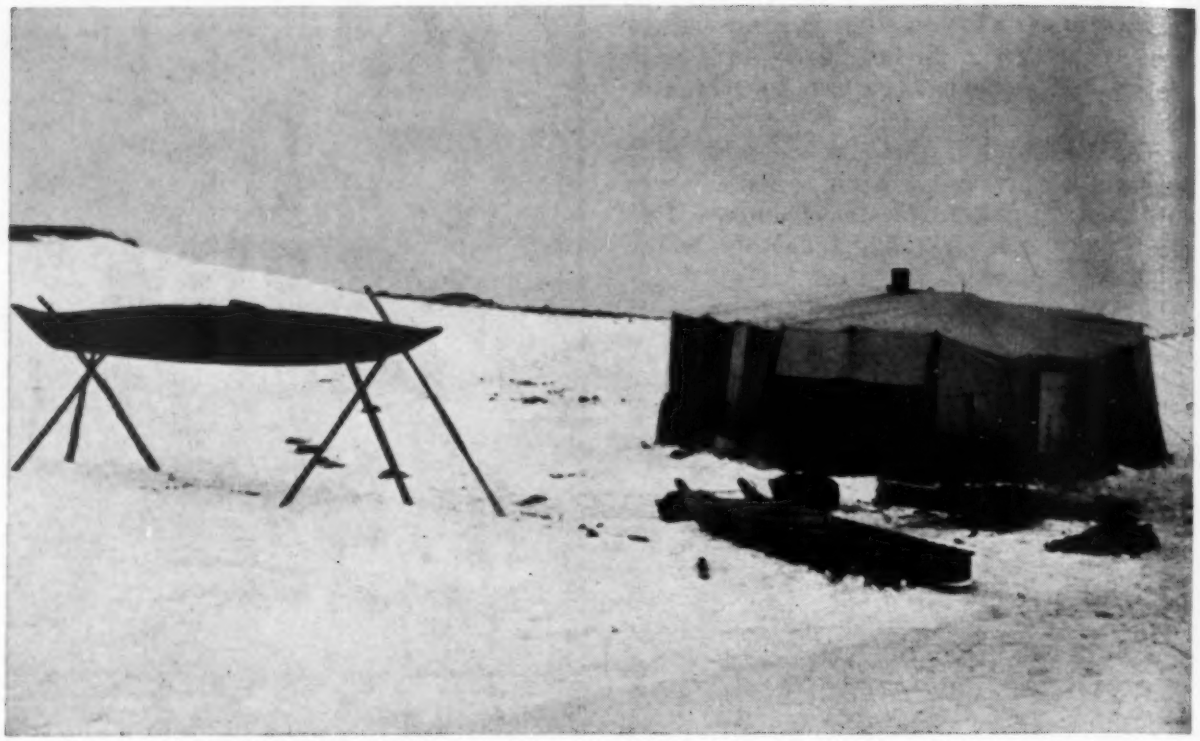
Surprisingly, no accurate maps of these important islands existed until well into the twentieth century, although their name appears on earlier British Admiralty charts. Old maps, including some from this century, show only open sea or irregular dots in this part of Hudson Bay. Robert Flaherty, as a result of his explorations in 1914 and 1916, published the first recognizable map of the area (in the *Geographical Review* of June, 1918) and indicated the occurence of large quantities of

iron-bearing rocks on the Belchers. Subsequent exploration was chiefly by iron prospectors and geologists, particularly those of the Belcher Islands Iron Mines and the Geological Survey of Canada, until 1933 when the first accurate map of the islands was published by the federal government. This sheet, which was printed at four miles to the inch, is still in use.

What is probably their most curious feature is immediately seen on any recent map. The remarkable aggregation of long, thin peninsulas and stringy islands in U-shaped and S-shaped patterns, zig-zagging over an area of nearly 5000 square miles of sea, is unique in Canada. These patterns are best explained geologically, for they reflect the various hardnesses of the rocks of the area as well as the degree of deformation or folding to which these rocks were subjected. The sandstones, limestones and iron formation of the islands were deposited as flat layers in the sea along with thick beds of volcanic and related rocks which erupted along long fissures in the sea floor sometime during Precambrian time, more than 600 million years ago. Subsequent to their deposition, horizontal pressures in the earth's crust folded these flat-lying sedimentary and volcanic rocks into a series of troughs and ridges, each trending a little east of north and measuring about ten to fifteen miles across, from trough to trough. In addition, there was a slight doming effect so that the area that is now the Belcher Islands



Rugged coastline along one of the many peninsulas of these islands.



The tent of a Belcher Islands Eskimo in spring. A kayak is lying on stilts to protect it from rot and hungry dogs, and a dogsled is on the ground nearby. Milton Freeman

The entire community helps in covering the frame of a newly-made kayak with sealskins. The frame is constructed from driftwood. Milton Freeman

Jimmy, who owns a whaleboat and is therefore one of the richest Eskimos of the district, Charlie, his son, and Jonassy, the carver, all worked for the Geological Survey of Canada in 1959.

stood at a somewhat higher elevation than the surrounding area. Erosion has since attacked the rocks to produce the strange patterns visible today, with the hard volcanic rocks, eroding only slowly, standing high over most of the more easily weathered sedimentary rocks. Sea level is such that the harder material is mostly above water, the softer material mostly below. Thus the undulating layers of dark volcanic rocks form most of the islands, whose distribution and patterns owe their origin both to the nature of the double warping to which the strata were subjected and to the present level of the sea.

Less than 200 of Canada's 11,000 Eskimos occupy the Belcher Islands. These nomadic hunters live chiefly off seal, walrus, goose and an occasional white whale, their living quarters being ice igloos in winter and canvas tents in summer. Hunting is done from kayaks, whaleboats, dogsleds or on foot, using harpoons or unbelievably rusty rifles. Seal skins and carvings are traded at the little Hudson's Bay post run by Sam Crow (also an Eskimo), for tea, tobacco, clothing, tent

A group of Eskimos at their camp near the Hudson's Bay Company post. G. A. Reilly

This little spaniel, about two inches high, was carved by Jonassy in the summer of 1959 on the commission of the author. Jonassy has never seen a spaniel and produced this carving using a crude sketch for a guide. J. L. Kirwan

canvas and certain food staples. Unfortunately, there is a tendency for some of them to settle near the trading post, a practise which results in depletion of game in that area and near starvation for the Eskimos. Some have depended upon working for the white visitors to the islands (mining engineers, scientists and prospectors) for much of their livelihood. The decline in interest by these groups in the islands may prove serious for some of these workers.

Perhaps the best known work of the Eskimo is his carving, which has been so successfully exploited by the white man. Some of the best come from the Belchers. In fact, there is a story told about a collection of these art works which was purchased directly from the carvers and which was later declared, by an expert, to be made up of imitations. The curator of the museum of a Canadian university, to whom they were presented for examination, thought that they were too well finished to be authentic! Of course, it must be remembered that none bore the little tag which declares the article to be genuine.

The soft talc-serpentine carving-stone is quarried on Tukarak Island, one of the eastern Belchers. This is one of the few sources of the stone and much is exported to distant carvers. In Precambrian times, during the eruption of the ancient volcanoes of the area, as the hot silica-rich rock forced its way through the magnesium-bearing limestone, chemical reactions between the two produced the magnesium silicate carving-stone found today. The new rock, being softer than either

A group of geese, by Moses, a Belcher Islands Eskimo, who traded it for two pounds of tea. J. L. Kirwan

of the rocks from which it was formed, lends itself well to shaping with tools.

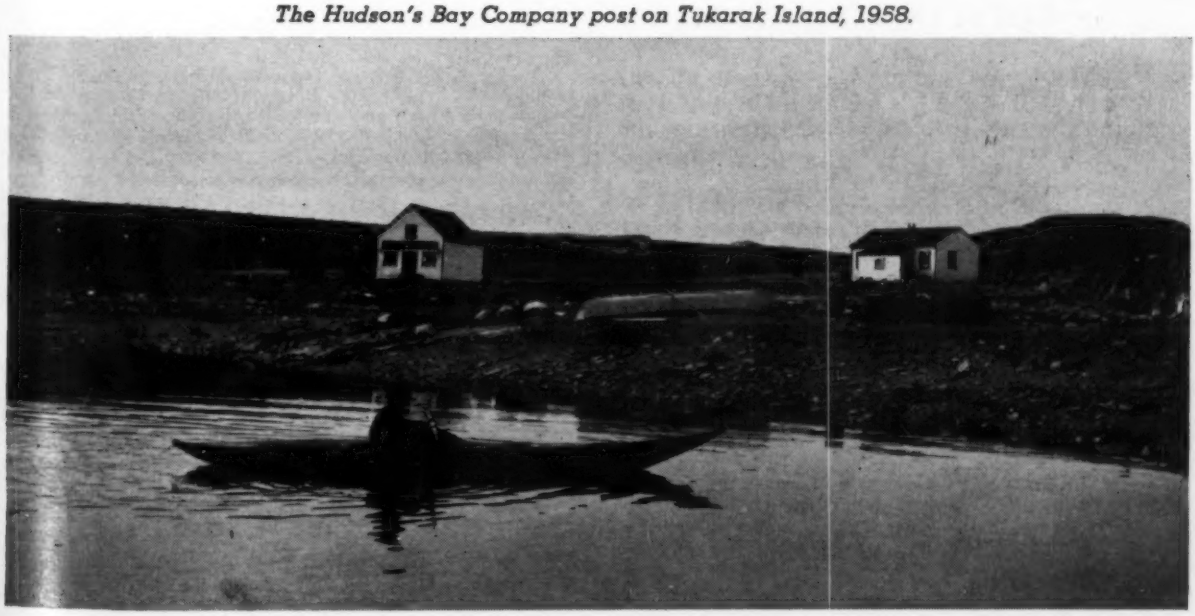
The carvers first crudely cut out the shape of their work with axes and saws, often taking great advantage of the variations in colouring of the rock to enhance the figure. Work with carpenter's rasps, penknives, sandpaper, steel wool and oiled cloth eventually add detail and finish to the work. Parts are joined with wooden pegs glued or forced into appropriate sockets and ivory or wood embellishments, such as tusks for walrus, are added. The carving is then ready for sale or barter, a ready market being supplied by the trading post or by visitors to the area.

Sources of food, the chief consideration of the Eskimo, are usually expressed in stone. Thus, because seal, walrus and goose are preferred foods, most of the carvings represent these animals. Because kayaks are used as the major hunting vessel in this area, excellent stone kayaks are made on the Belchers. The scorned fish is rarely represented.

A pound of tea or coffee, cigarets — or somewhat more than the equivalent value in money — are usually welcome trading items for small or medium-sized carvings. However, prices up to five dollars or more are sometimes paid for larger items such as stone kayaks. Articles have been successfully commissioned from the artists, some of whom can do excellent work, even from pictures. Choice of fee is usually left to the buyer. Kapik (English name is Jonassy) is probably the finest craftsman on these islands, for his work shows some of the best proportion, symmetry, detail, taste and imagination to be found in this art form. However, Jonassy comes as close as anyone does to mass-producing the carvings; for the members of his family form an efficient "assembly line", the finished products being made very quickly, in successive stages and by different people.

The future of these islands and of their Eskimos seems better than the past. A new Anglican church and a school — the first on the islands — have been built on the western part of Flaherty Island and there is talk of moving the Hudson's Bay post westward to where food is more plentiful. Iron has been the chief attraction for the white man and, although little has been mined, there are possibilities that it will be of economic value one day, to provide work for the Eskimo and a return for the investor.

The Hudson's Bay Company post on Tukarak Island, 1958.



A view of Eriskay with the Sound of Barra and Barra in the background. The people living here are descended from those who were "cleared" from South Uist.

The Outer Hebrides of Scotland Today

by KENNETH ROBERTSON

Photographs by the author.

THE following is a statement made by some immigrants from the Outer Hebrides on arriving in Canada in the autumn of 1851:

We, the undersigned passengers per ADMIRAL, from Stornoway, in the Highlands of Scotland, do solemnly depose to the following facts:—That Col. Gordon is proprietor of estates in South Uist and Barra; that among many hundreds of tenants and cottars whom he has sent this season from his estates to Canada, he gave direction to his factor, Mr. Fleming of Cluny Castle, Aberdeenshire, to ship on board of the above-named vessel a number of nearly 450 of said tenants and cottars, from the estate in Barra; that, accordingly, a great majority of these people, among whom were the undersigned, proceeded voluntarily to embark on board the ADMIRAL at Lochboisdale, on or about the 11th August 1851; but that several of the people who were intended to be shipped for this port, Quebec, refused to proceed on board, and, in fact, absconded from their homes to avoid the embarkation. Whereupon Mr. Fleming gave orders to a policeman, who was accompanied by the ground officer of the estate in Barra, and some constables, to pursue the people, who had run away, among the mountains; which they did, and succeeded in capturing about twenty from the mountains and islands in the neighbourhood; but only came with the officers on an attempt being made to handcuff them; and that some who ran away were not brought back, in consequence of which four families at least have been divided, some having come in the ships to Quebec, while the other members of the same families are left in the Highlands.

The undersigned further declare that those who voluntarily embarked did so under promises to the effect that Col. Gordon would defray their passage to Quebec; that the Government Emigration Agent there would send the whole party free to Upper Canada, where, on arrival, the Government agent would give them work, and furthermore, grant them land on certain conditions.

The undersigned finally declare, that they are now landed in Quebec so destitute, that if immediate relief be not afforded to them, and continued until they are settled in employment, the whole will be liable to perish with want.

(Signed) HECTOR LAMONT,
and 70 others.[1]

This gives a miserable picture of a few of the large number of Islanders who, for one

[1] *History of the Highland Clearances* by Alexander McKenzie, F.S.A.

reason or another, had to emigrate to Canada between the years 1775 and 1850. They made a great adventure story of courage, hardship and eventual success which has been written many times on both sides of the Atlantic.

Very few of these emigrants could write and after infiltrating to the remote settlements, became lost. All connection between them and the homeland were absolutely severed. Therefore nothing whatever is known about these relatives in Canada among the inhabitants of the Outer Hebrides today. The estate records are equally uninformative; it was imprudent to keep records of the discreditable events. Similarly, little is known generally in Canada of the subsequent happenings in the old island homes.

A word about the situation at the parting of the ways and the circumstances which led up to it is necessary.

The die was cast for the people of all the Highlands in March 1746 when the Jacobite forces were finally routed at the Battle of Culloden Moor, outside Inverness. Up until then, the north and west had been divided up into clan territories ruled by despotic chiefs. The clansmen lived in miserable hovels, cultivating small strips of land and pasturing a few cattle and sheep on common grazing. For this privilege, every able-bodied man had to obey the call to arms in the service of his chief; this was done by passing round the Fiery Cross. The clans in the more geographically remote areas were quite outwith the jurisdiction of the central government. After the rebellion however, those chiefs who survived were divested of all military power, the population was disarmed, wearing of the kilt was forbidden, the rough country was opened up by roadbuilding and the forts were heavily garrisoned. Thus the law of the Realm was enforced. Eventually when their lands were restored to them, the chiefs found themselves in the role of landlords with tenants; the clan system had gone for ever.

The former clan warrior now found himself to be a mere serf with no rights and no security and the landlords were quick to take advantage of this to wrest ever greater rentals from him against the threat of eviction. The resources of the Islands could not support such demands and awful poverty resulted, aggravated by a steady rise in the population owing to the cessation of local wars and feuds and the benefits of recent medical advances. The prevalent potato crops adequately fed the large family but were quite unprofitable. Thus the admirable, hard-living people were reduced to an under-fed, unhealthy, dispirited community of paupers with but dreams of the past and no hope for the future.

Around the middle of last century, Col. Gordon, the proprietor of lands in South Uist and Barra in the Outer Hebrides, found himself responsible for such a starving com-

The hospital of Daliburgh, South Uist. Opened in 1956, it is staffed by nuns of the Sacred Heart Order, and offers a general and maternity service to South Uist and the neighbouring islands.

Peat cutting is the first and a very important job of the yearly round. Here at Peninerine, South Uist, the dried peats are being collected for stacking in the croft. Uist's highest hill, Beinn Mhor (2,034 feet) rises beyond.

munity whose plight was attracting more and more unwelcome public attention. Under pressure, the government advanced money for the relief of the distressed areas and the remedy eventually arrived at was to use this to reduce the population by forced emigration, the resulting cleared land to be given over to the very profitable tenant sheep-farmer.

A crofter of South Uist cuts peat below the high tide line.

It was the harsh, unscrupulous execution of this plan which gave rise to so much misery. The statement quoted above gives a clue to the methods used. Misery born of base motives and injustice lives long in the memory of men, and today, the Clearances are spoken of throughout the Highlands with great bitterness and resentment.

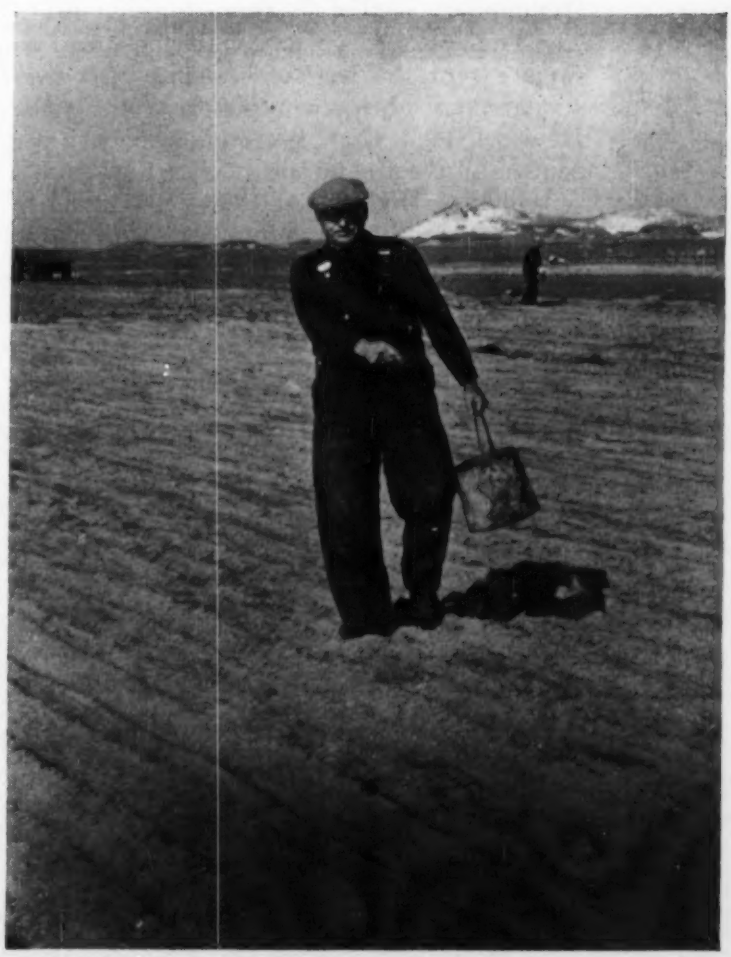
Some 5,000 odd souls must have left the Outer Hebrides in the twenty years preceding 1860. Not all of these left as a result of direct force; the burden of life was made insupportable by additional factors such as the potato blight between the years 1843-50. Also there survived from the time of the rebellion, a great yearning for the religious and political freedom known to prevail in Canada and elsewhere; some of the hard hit areas in the Islands were Catholic besides being active Jacobite supporters in "the forty-five".

Planting potatoes on the machair, a level fertile stretch of land running up the entire western side of South Uist. Note the seaweed used as fertilizer.

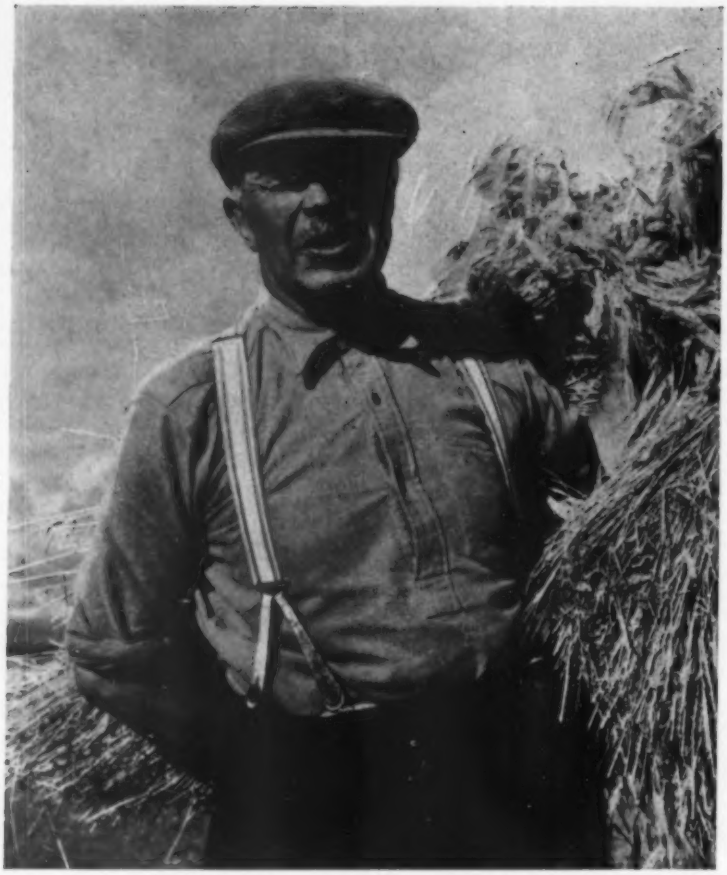
As the last straw, the market for kelp dwindled away. Kelp is the ash of sea-weed from the shore, gathered and burnt in kilns by the crofter for the gain of 30 to 40 shillings a ton — representing twenty tons of wet weed. A family, toiling day and night of the short season, produced four or five tons of kelp. When demand was great during the Napoleonic wars, the estate in South Uist as "middle man", made some £15,000 net profit from supplying kelp as an important raw material in the growing chemical industry. However, in 1825, the tariff on barilla, a cheap Spanish substitute, was lifted and the industry, so vital to the crofter, faded out.[2]

Nova Scotia and Cape Breton Island received the majority of Hebridean settlers of this period. Those who went to the towns and cities elsewhere in Canada have been absorbed and scattered, but in these areas, the Highland communities have maintained their identity to a remarkable degree. The counties of Pictou and Antigonish were settled first, then Victoria and Inverness on Cape Breton. The people from the islands of Benbecula, South Uist and Barra settled in Antigonish or Cape Breton; being Catholic they tended to form separate communities while those from other parts settled in Pictou

[2] *The Scotsman*, 22 February 1902.



In most areas crops are still sown by hand.



Neil MacPherson of Garrigannachidh, South Uist. A relation of his, William MacPherson, left for Canada about eighty years ago, and he still keeps in touch with the Canadian grandchildren.

and also Cape Breton. Between 1790 and 1830, it has been estimated some 25,000 Highlanders settled in these four counties. The Gaelic language and traditions, and to some extent the way of life, has been preserved there no less completely than in the Hebrides itself. Cape Breton has seventy per cent of all the Gaelic speakers of Canada.[3]

While the Highland settlers were toiling to clear the smothering spruce forests of Nova Scotia, their relations at home were compelled to struggle for a livelihood among the bogs and rocks of coastal strips and inhospitable islands to which they had been banished. The task of clearing the richer lands was done with such ruthless efficiency that Hugh Miller (noted writer and geologist of last century) was able to say of the Island of Rum, "We could see among the deserted fields the grass-grown foundations of cottages razed to the ground; but the valley, more desolate than that which we had left, had not even its single inhabited dwelling; it seemed as if man had done with it for ever." Rum was cleared in 1826; by 1881 the original population of over 1,000 had shrunk to 96 souls.[4]

[3] "Population and Settlements in Nova Scotia", *The Scottish Geographical Magazine*, Volume 70, Number 2.

[4] *History of the Highland Clearances* by Alexander McKenzie, F.S.A.

Inevitably, through the press and court proceedings, the facts of the clearances reached the consciousness of the British public, and the landowners had to pursue their policy with ever greater moderation. In 1816, Patric Sellar, Under Factor for the Marquis of Stafford, was placed on trial for culpable homicide in connection with the atrocious evictions in Sutherland. He was acquitted, but posterity will remember him for having brought so much evil to public notice.

But life went on, albeit at a mere subsistance level; homes were precariously established and so adaptable were the people in the barren areas, that not only did they thrive but actually multiplied quickly; herein lies the key to the next phase in the Hebrides which is well illustrated by the following extract from the *Westminster Gazette* of March 6th., 1903:

> The extraordinary seizure of part of Lady Gordon Cathcart's estate in South Uist by a large number of landless cottars will probably bring to a crisis a situation which has been developing in that part of the country for some time past. The cottars in question have taken forcible possession of a portion of the estate, and are proceeding to cultivate it in defiance of all threats and remonstrances. They allege that the only alternative to their decisive action is starvation . . . 'Nearly all the best land', said our informant, 'is let to large sheep farmers, and much of that land was in cultivation and supported a large population in the days before the memorable clearances of fifty years ago . . . In Lewis there is a most curious state of affairs. For the last twenty years the cottars, not in a body but singly, have been taking possession despite the Estate Regulations, of such land as they required for building purposes and gardens. For this land they pay no rents, rates, or taxes. There are probably 2,500 people living under those circumstances and it has been going on for so long unchecked that it has come to this now — that anybody who wants a bit of land simply goes and takes it.'

The country has come a long way on the road to social reform; nevertheless, the cottars were sent to prison for two months in June 1908 for raiding and taking possession of Vatersay, one of Lady Gordon Cathcart's Islands south of Barra. The affair aroused national interest and sympathies all rested with the Barramen. *The Peoples Journal* of the same date has a heading: "Vatersay Relief Fund — Help for wives and children of imprisoned men" and talks of "victims of the Iron Rod". It is clear that the grievances of the cottars were at last suffered to be expressed, and the government was obliged to set up various official bodies to deal with them — The Congested Districts Board; the Napier Commission; the Crofters' Commission for examples — while unofficial organiza-

tions like the Land League and the Highland Reform Association, concerted the efforts of the aggrieved. Of greatest impact were the Crofters Act (1886) and the Compulsory Education Act for Scotland (1872). The first brought security of tenure, fare rents and compensation for improvements carried out by the tenant. The second ensured that in future, everyone would be taught to read and write English in the Gaelic speaking Highlands, and thereby read of the people in other places and ponder their own situation anew.

The obvious answer to the land hunger problem was to divide up the large deer forests and sheep farms comprising the best arable and grazing lands and vest it legally in the hands of the crofters. The Congested Districts Board had power to do this, but it was unpopular with the landowners who favoured the relief afforded by assisting the crofters to emigrate; once again there was an exodus from the Hebrides to Canada and other Commonwealth countries between 1880 and 1930. The assistance this time was sincere and well organised though the motives were not altogether philanthropic. These later emigrants got an incomparably better start as can be judged from the following letter sent back from a Benbecula man:

Benbecula P.O., Sask.,
Canada. 22nd. August 1912.

Lady Cathcart,
Cluny Castle, Aberdeen.

Dear Lady,—For some time I have been wishing to write to you, but something always came in the way to prevent me from doing what I ought to do; but it was not that I forgot your great kindness and liberality to me and to my countrymen and friends who came out to this great country with me over twenty years ago by your kind and free assistance, providing us all with sufficient advances of money to make a fair start in this country . . . But we are all now able to buy land as circumstances will permit, and build fine dwelling houses, stables, barns, granaries, and many other buildings and improvements on our estates, buying a better class of horses and cattle, pigs, and everything else in proportion, double covered buggies, and single covered buggies but no automobiles yet, though some of them are seriously thinking of them . . . We shall always speak in loving memory of your Ladyship as long as we live, and of what you have done for us, which our fathers and mothers could not do for us.

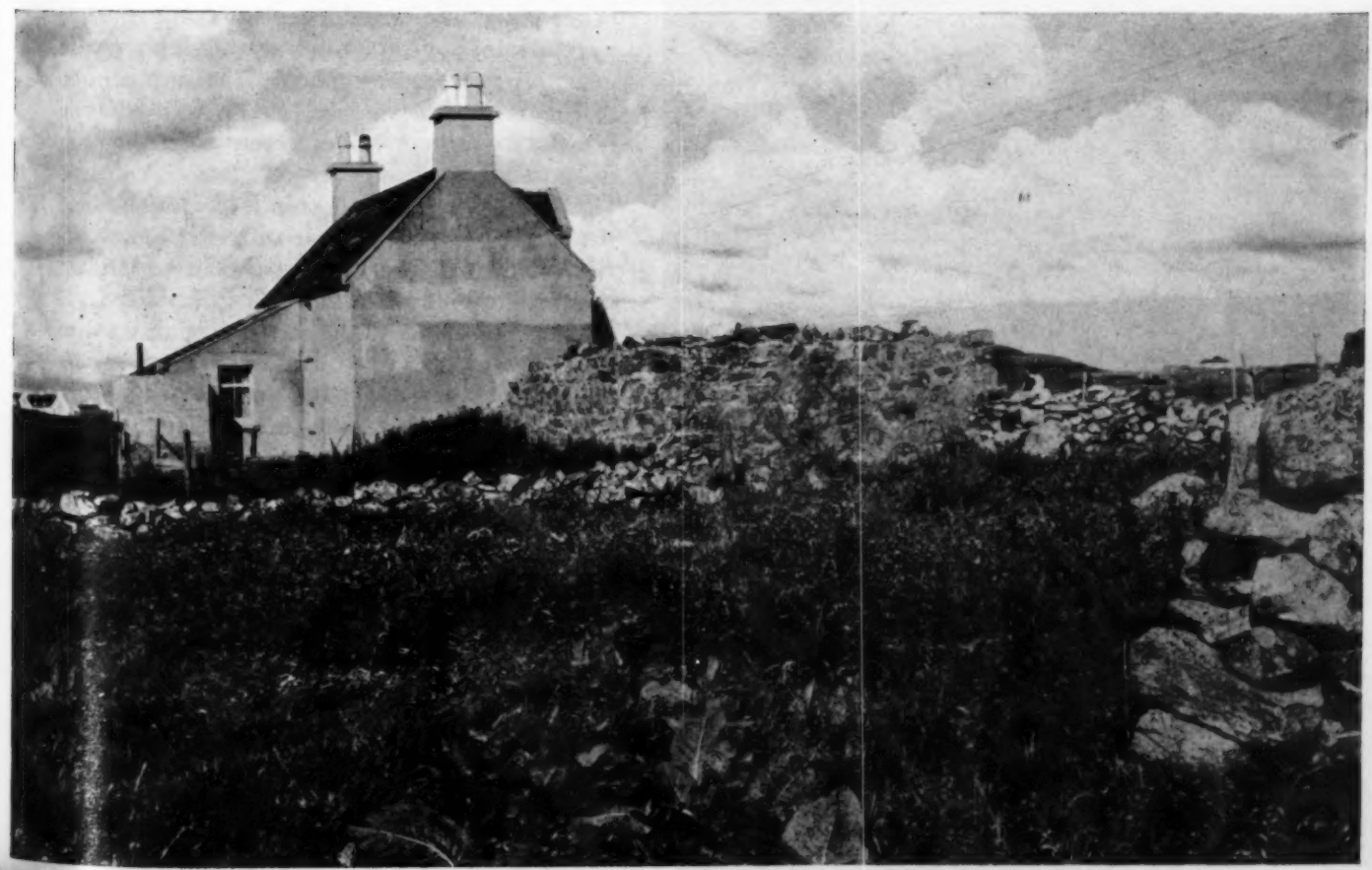
The letter is signed Donald MacDiarmid[5].

Letters from Moosomin, Red Jacket, Wapella, Benbecula and St. Andrews in Saskatchewan, have been coming back with news of the settlers ever since these early days; most bore success stories.

Those now opulent Scottish-Canadians would doubtless be a little sad to discover that the general pattern of life in the Hebrides has not changed radically since the days their fathers left; certainly it has not kept pace with the changing face of Britain as a whole.

[5] *How Scottish Settlers Succeeded in Canada.* Published by the Minister of the Interior, Canada, 1912.

The ruins in the centre mark the site of John MacDonald's house in Liniclate, Benbecula. MacDonald emigrated to Saskatchewan around 1880, and the famous "bocan beag" or little ghost which had supposedly haunted the house, is said to have followed the tenant to Canada.



Although there is no poverty in the Islands, the people seem powerless to relax the extreme frugality of so many generations past. They show a reluctance to indulge in luxuries. The typical low thatched cottages with black peat-stained interiors sheltering box-beds and a few sticks of comfortless bare wooden chairs or benches and the inevitable peat-burning stove are still commonplace. Such a home is no expression of poverty; it is simply that it has always been like that. There are others like shining show pieces, as quaint and snug (and as inconvenient) as one could wish. About half the people have moved out of the cottages and built bungalows alongside, using the old place as a byre. These are modern dwellings erected by the owners, and boasting electrical fittings and gadgets, piped water and so on. However, they appear incongruous, utilitarian and devoid of any features purely aesthetic in character.

North Uist, Barra and some of the smaller islands, still have no electricity supply and piped water is still limited to the more populated areas.

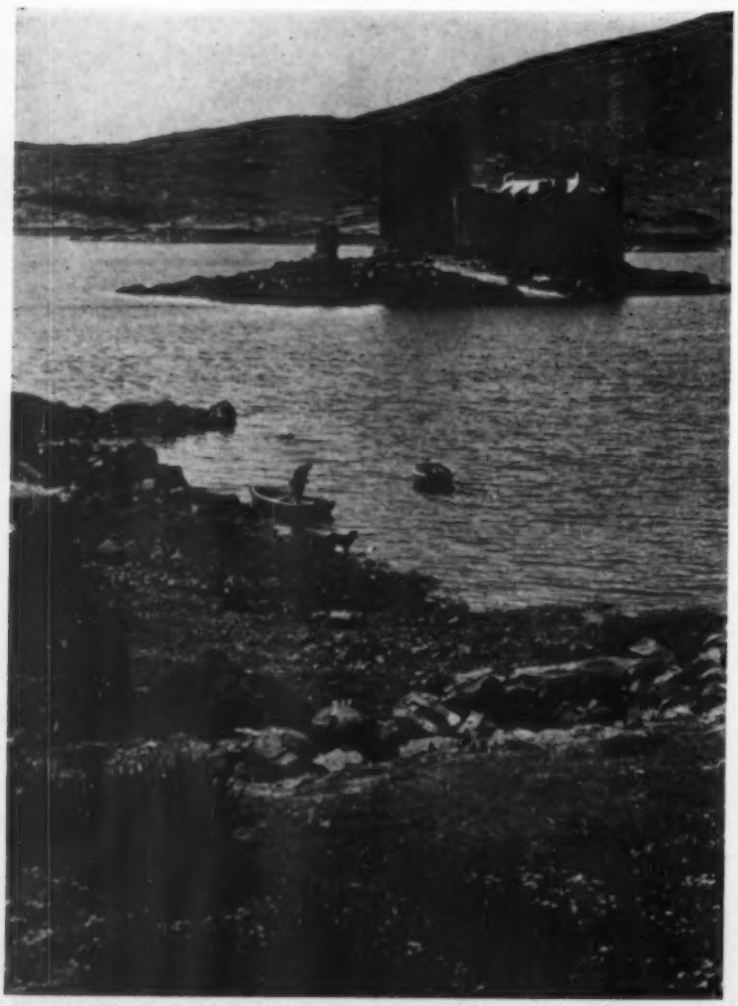
With the inception of the Highlands and Islands Medical Scheme at the end of the first world war came adequate medical coverage further extended and improved by the National Health Service in 1948; the islander's dread of illness has been much relieved.

There is a particularly good school in Stornoway, Lewis, taking pupils up to school-leaving standard. Others less advanced but as modern are placed strategically throughout the long Island.

The Hebridean can enjoy the radio but there is no television except for a tight area around Stornoway. The telephone is, of course, everywhere.

British European Airways run a regular service between the mainland and Barra, Benbecula, Tiree, and Stornoway. Glasgow is thus brought within an hour's journey of any of these islands. World travellers have met their worst sailing conditions in the Minch and to be able to avoid crossing on those wild seas is a great boon to islanders passing to and from the mainland.

The Hebrides are unique in two important respects; one is the physical beauty of the place, and the other is that here survives the unadulterated Highlander in direct geneological line from the time of the early Christian missionaries, the Norse invaders or the Lords of the Isles. And not unexpectedly, here flourishes in greater abundance than any other place, living evidence of Gaelic culture in folk-lore, bag-pipe music, songs, the bardic art, and the simple *ceileidh*. The importance of this is now recognised and there is a fever of activity among students to record as much as possible before it is too late. Professor C. W. Dunn, in his book *Highland Settler*, draws a delightfully clear picture of the cultural aspect of the Gael in the Cape Breton district, and it seems that a remarkable parallel can be made with the situation in the Hebrides today. With a new sense of values in this atomic age, the young people are turning their backs on the old way of life with its hardships and poor material reward, and the whole concept of tradition, so revered in the past, is shrugged off as a silly amusement fit for cranks and the aged. The survival of the Gaelic language is questionable too, even in the Hebrides where it is normally used by everyone except on official occasions



Kisimul Castle, at Castlebay, Barra, was burnt down in 1796. The present Chief of Clan MacNeil of Barra restored the castle, and in June 1959 took up residence in it.

Viewers, exhibitors, and entries at an agricultural show at Balallan, Lewis.

or when strangers are about. The language is a handicap to children, and the only argument in favour of preserving it in common use arises from strong romantic or nationalist feelings. However, Gaelic is being taught in all the Island schools.

A second striking parallel can be drawn between the Canadian-Highland settlements and the Hebrides in the general economy of both. The farms and crofts permit reasonable homes at a reasonable level of living, while part-time jobs like inshore fishing, road building and catering for tourists are important in their seasons. Two additional subsidiary occupations are peculiar to the Hebrides; the weaving of "Harris" tweed and collecting sea-weed for the Scottish Alginate Industries plants in South and North Uist. The diligent attention to either can bring in about £10 a week.

The stand-by is, and always will be, agriculture — actually the breeding of store

South Uist crofters waiting to take their animals into the sales ring.

Castlebay, Barra. It was over these hills that the people of Barra were chased and rounded up during the time of the forced emigrations. Two girls of twelve and fourteen years, daughters of a John MacDougall, escaped capture by living in the hills though their parents were sent away.

The unpretentious interior of a more humble thatched dwelling house of the Hebrides.

The Atlantic Ocean in a calm mood as seen from East Kilbride, South Uist. Barra lies on the horizon.

cattle and hill sheep. All dairying is for local consumption and there is no serious poultry farming. The arable land is given over to potatoes — again for local use — and hay, small oats, and rye, all for winter cattle-feed.

There is little to be had locally in the way of other kinds of work; there were some temporary well paid jobs with the contractors engaged on the government's guided missile range in South Uist and on the North Ford Causeway project between Benbecula and North Uist. The greatest lack is of work for the teen-age girls of the islands.

Apart from Stornoway, the herring industry has practically ceased in the Outer Isles. The old folk bemoan the time when Castlebay harbour in Barra was like a forest with the masts of fishing boats and even little Eriskay could put forth fifteen or twenty of her own fine boats. There was a stir and fervour about the place with the usual shore jobs of drying and repairing nets, baiting lines and gutting fish with which the women helped too. Now there are only four or five boats altogether operating at the south end. The reasons often put forward are that the nearest market at Mallaig is too far away; that the trawlers have spoilt the fishings; that the prices are poor: but the real reason is that the young men have "lost the notion" for the hard work and uncomfortable conditions involved in working the small boats. The few who persisted have made a fortune.

There is no question of the Isles being decadent, depressed and tumble-down; on the contrary, there is an air of business, prosperity and happiness which the visitor finds hard to reconcile with the obviously humble means of support. The answer lies in the extensive government help to the crofting communities.

Some have expressed the belief that, while the old days were very bad, the pendulum has swung too far in the opposite direction and the islanders are getting it too easy now with a resultant growing tendency to indolence. Certainly he can get by with the minimum of effort, but all the aids are designed to encourage the man of energy and capacity. Here, for example, are a few of them: Crofter's Grant Scheme; Livestock Purchase Loans; Hill Cattle Subsidy; Calf Rearing Subsidy; Grants and Loans for Crofter Houses and Buildings (£650 for a new house); Grants and Loans for Fishing Vessels and Engines (up to eighty-five per cent).

It is tempting to ask why the government is willing to virtually pay people to live in the Isles and other remote places of the Highlands — the same government which passively condoned the atrocities of the clearances some 150 years earlier. Let a passage from the Taylor Commission's Report on the Highland problem provide the answer:

> We have thought it right . . . to record our unanimous conviction founded on personal knowledge and on evidence we have received that in the National interest the maintainance of these communities is desirable because they embody a free and independent way of life which in a civilisation predominantly urban and industrial in character is worth preserving for its own intrinsic value. We put this first because we believe that the crofters feel it to be true and are indeed often capable of expressing it, and because we are convinced that those who fail to recognise it will never begin to understand the Highland situation or make helpful proposals for its improvement.

The interior icefield region of northern Ellesmere Island.

The edge of a glacier during the melt season.

A DC 3 transport at Lake Hazen base camp.

*Operation Hazen—The Second Summer**

by J. R. LOTZ

Photographs in this article are by Dr. J. S. Tener for the Canadian Wildlife Service, Dr. R. L. Christie for the Geological Survey of Canada, John Powell, the author for the Dept. of National Defence.

WITH A fully equipped base camp established on Lake Hazen, a minimum amount of time was wasted before the third phase of "Operation Hazen" got under way. In the C-119 that landed on April 29th were three army specialists. Major T. L. Hoy, a psychologist, interviewed each of the winter crew in turn. Sergeant J. E. Robertson, Royal Canadian Signals, began to string up a new antenna system, and to check the radio equipment, while Sergeant David Engel examined each vehicle, and got the TD 9 tractor ready to clear the snow from the lake ice to make a runway.

In addition to the winter party and the three Army men, there were ten more expedition members to accommodate as well as two full R.C.A.F. crews. The store hut became an R.C.A.F. barracks, and by the evening of our arrival a small tent camp had arisen around the huts. All the scientists who had taken part in the first phase of "Operation Hazen", except John Filo, returned to continue their work in 1958. In addition to these seven, Brian Sagar, assistant glaciologist, McGill University, and Barry Walker, assistant geologist from the University of Toronto, flew in with the advance party. Hans Weber gravimetrist from the University of Toronto, arrived on the same day in the comparative comfort of the DC3; all the rest of us had flown from Resolute in a C-119 in which every available space was crammed with equipment and supplies. Lieutenant-Commander J. P. Croal, the liaison officer, also arrived with the first plane.

The operation was staged through Fort Churchill, Resolute and Thule. In six flights between April 29th and May 14th, all the summer needs of the expedition were flown

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into the Lake Hazen base camp.

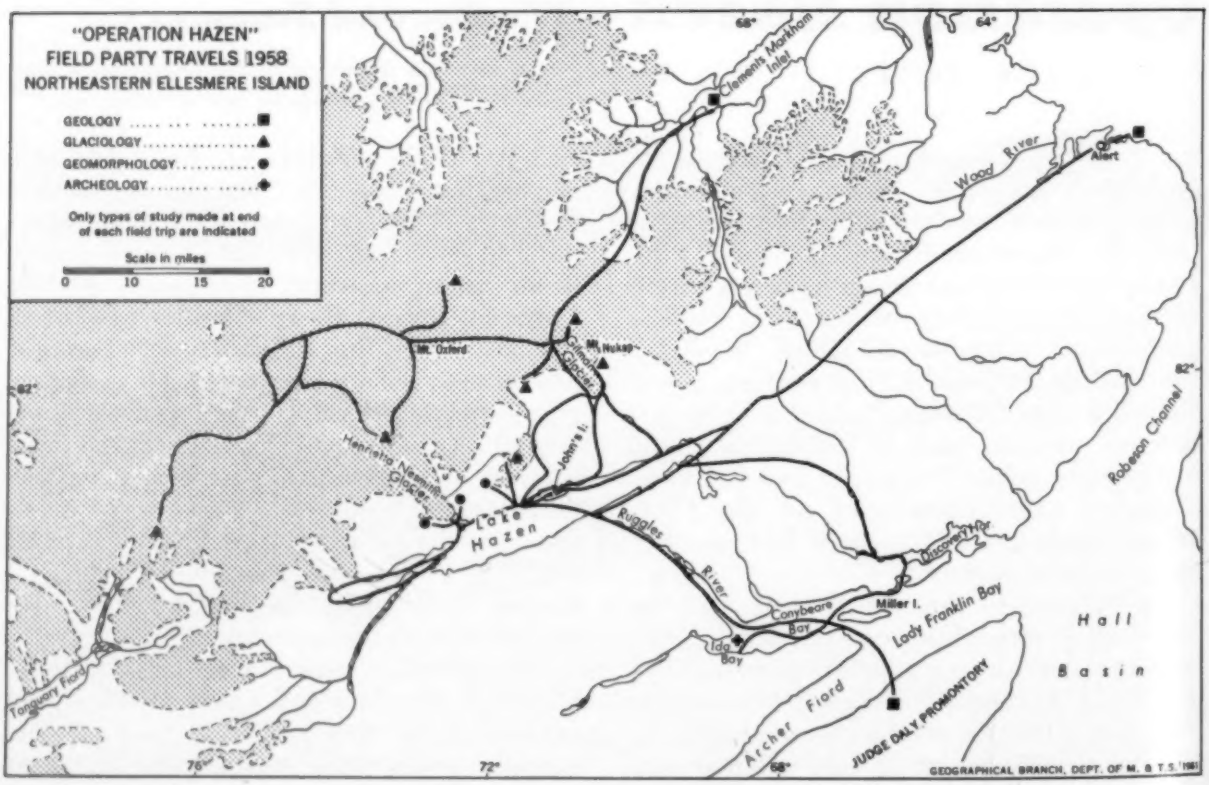
On April 30th, the DC3 made its first flight to the Gilman Glacier. For the month of May, this Dakota of 121 Communication and Rescue Flight enabled field parties to range far and wide over northern Ellesmere Island; in addition it made possible visits between base camp and the glacier camp in an easy thirty minute flight that saved two days of hard sledging.

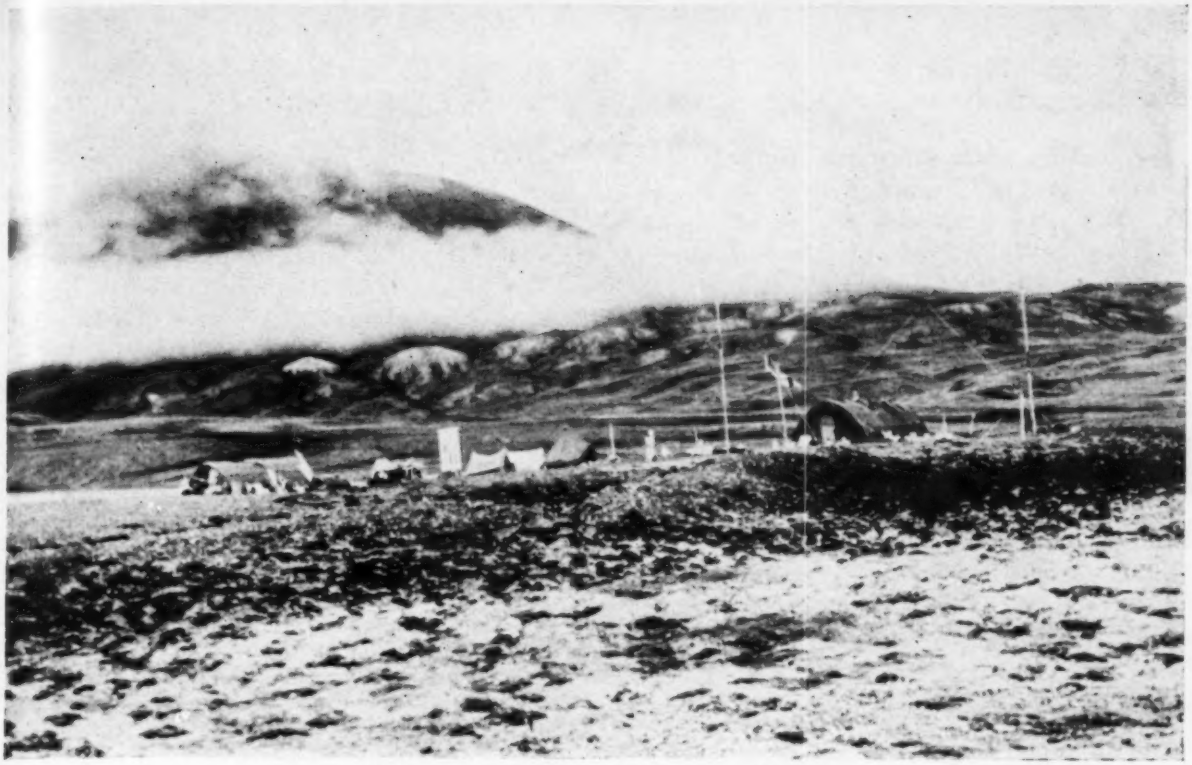
The two teams of dogs who had been with us in 1957 returned again in 1958—it was like meeting old friends as they tumbled from the DC3. In addition to those used in 1957, another team from Kanak served the expedition in 1958. Two teams were kept on the glacier, in addition to the two motor toboggans; one dog team and an oversnow vehicle and two canoes provided transport at the base camp.

May began with the hard work of digging out the drifted-up tents that had been left pitched on the glacier. When I had left camp in the previous autumn, the tents had stood in a sodden landscape, with grey clouds above. Now they were buried in white snow, under a clear sky. The whole glacier looked as if it had been laundered, and a fresh blue sky spread over it.

Work began on the glacier as soon as the instruments were dug out. The seismic gear was assembled and tested, the meteorological instruments checked and installed, and the work of drilling out ice cores began. On May 5th I began synoptic weather observations, and two weeks later all instruments were in position on the thirty-foot mast that was used for micrometeorological studies. Six scientists remained permanently at the glacier camp during the summer, although all took part in traverses and sledge trips.

During May, a network of gravity stations was established in northern Ellesmere Island. A gravity meter consists essentially of a piece of quartz suspended on a spring; variations in the earth's "pull" affect the position of the quartz. Readings of the gravity meter had been taken at control points at Fort Churchill and Resolute Bay on the way north. Further readings were taken at the base camp, on the glacier, near Ward Hunt Island on the north coast of the island, at Fort Conger, at Clements Markham Inlet, and at Alert Weather Station. Another type of gravity meter,





The base camp during the summer, 1958.

which measures relative gravity differences only, was used during traverses and at various places on the glaciers and ice cap. It was possible, using this gravity meter, to obtain thicknesses of ice over rock.

The work on the glacier during the summer of 1958 was similar to that done in 1957, and the camp routine also was much the same. To study the numerous problems that the glaciology of this region presented required a minimum of two field seasons. One of the biggest problems in scientific investigations in the Arctic is the absence of long term weather records, and the widely scattered distribution of weather stations. A quick way of getting a record of the snowfall and the summer weather in previous years is to dig or drill a hole into the ice above the firn line. Here, where each year's winter snow has melted and refrozen in the summer, is evidence of how warm or how cool a particular summer was.

The aim of the glaciological investigations on the Gilman Glacier was to obtain an accurate estimate of the amount of snow that accumulated during the winter on a typical glacier in northern Ellesmere Island, and to discover how much melted during the summer. The two summers' work, using glaciological, meteorological, gravimetric, seismic, and survey data was used to estimate the "mass balance" of the glacier, and served to give some indications as to whether the glacier was advancing, retreating, or thinning. The investigations of the glacier and the surrounding nunataks were complemented by other studies in geomorphology, geology and botany, carried out around the edge of the Gilman and other glaciers in the area.

The drawing of the broad picture of conditions in the area was done by painstaking attention to detail in the field. To find out how fast the glacier was moving, it was necessary for the surveyor and his assistant to climb a rock spur overlooking the glacier where sights had been taken in the previous year, and to train the theodolite on the stakes set in the glacier. From the observations made in 1957 and 1958, it was determined, that, at a point about half a mile up glacier from our camp, the glacier, winter and summer, was creeping forward at a rate of a little over two inches a day. The glacier snout was studied again, and measurements to it made from the cairns put up in 1957. Between June and August, 1957, the snout did not move, but from August to May, 1958, the glacier advanced about 15 feet. During the summer of 1958, between May 12th and August 16th, the glacier was found to have receded over 21 feet.

In 1958 we knew what sort of weather to

expect during the summer. The calm clear weather of May persisted into early June. When the melt began, life again started to get wet, and travel and work were restricted by fog, snow, and rain. From the weather record 1958 appeared to have had a cooler summer than 1957. Although damp at times, we were seldom cold at the glacier station, and never had to bundle up in heavy clothing during the summer. We found that we had to repitch and resite our tents on fewer occasions during the second summer. While life was still very wet, and the glacier surface rotten and slushy in parts, there were fewer melt streams flowing through the camp, and occasional falls of snow gladdened the hearts of the dogs who were never happy when they had to lie on ice.

In both years the net of ablation stakes set in over the glacier enabled an estimate to be made of the amount of ice that was lost from the surface of the glacier. At the expedition camp in 1957, over three feet of ice and snow disappeared from the glacier surface; in 1958, only a little over two feet melted away. From the information gathered during the two years of "Operation Hazen", it was discovered that the Gilman Glacier lost the equivalent of over forty million cubic yards of water during the period 1957-58. Since the summer of 1957 was warmer than that of 1958, the loss during this year must have been greater. This glacier, then, appears to have a negative regime, losing more ice in the warmth of summer than it gains as snow during the winter.

Throughout the summer of 1958, there were numerous journeys out of the glacier camp by dog team and snow toboggan to collect data on this unknown part of the Arctic. In the first summer, work had been restricted to the glacier itself, but with the increased mobility available through the use of the motor toboggan, and the DC3 in May, it was possible to range much farther afield. One of the most important and significant journeys of this season was made in May by Christie and Walker. Starting out from base camp with Hattersley-Smith, they travelled the easy way to the mouth of the Gilman River by being towed with their dogs on the

Contorted Cenozoic coal measures found in the lower Gilman River valley.

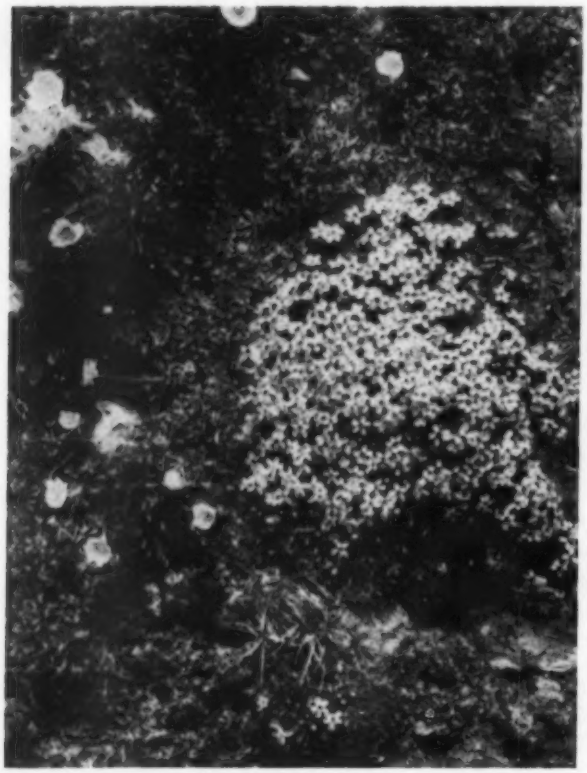
Barry Walker and three pack dogs take a short break during a field trip over the Arctic tundra northeast of Lake Hazen.

sledge behind the oversnow vehicle. From the river mouth they sledged up the valley, over the snout, and reached the glacier camp on May 14th. On May 18th, the DC3 landed the two men and their dog team in Clements Markham Inlet. Their journey back from here to the base camp was one of the most arduous undertaken during the whole of the expedition, and represented the first crossing of the interior ice of northern Ellesmere Island. After reaching the Gilman Glacier camp on the 30th, they set off for base camp on the following day. On May 26th, the DC3 flew Weber, Arnold and Sandstrom with another dog team, over to the same place on Clements Markham Inlet where Christie and Walker had begun their traverse.

During their trip back to the Gilman Glacier camp, the three men completed a gravity and level survey. This was all part of the slow unrolling of the map of northern Ellesmere Island, and the accurate delimitation of its main features.

In late June and early July, Hattersley-Smith and Sagar made another historic journey into the unknown icecap region of the interior. Apart from isolated landings by the DC3 in May, this region of perpetual ice, covering over 11,000 square miles, had never been visited. The two-man party travelled up the Gilman Glacier and established a camp near Mount Oxford. Exploratory trips were made to the heads of the glaciers draining into Disraeli and M'Clintock fiords on the north coast of the island. In the west, they reached a glacier from which Tanquary Fiord could be seen in the distance, some twenty miles away. Other journeys took them to the head of the Henrietta Nesmith Glacier. Throughout this region glaciological observations were made, and the geology of the nunataks that rose above the interior ice surface was studied.

From late April until mid-August intensive work proceeded at both the base camp, and on the glacier. In the short High Arctic field season, it was necessary to cram as much work as possible into three and a half months. In May, while the DC3 was available, food and fuel caches had been laid around the



Some summer flowers at Lake Hazen: clump of campion (Silene acaulis) *and mountain aven* (Dryas integrifolia).

lake, and in Archer Fiord and Discovery Harbour. Other depots had been established by the oversnow vehicle at the mouths of the Gilman River, and at both ends of the lake. During the summer, each field party had the comforting thought that they were never very far from food and fuel. While these trips were being made, the weather observations continued at three-hourly intervals, and the observers, in their spare time, undertook botanical, glaciological, geomorphological and wild life studies. On May 30th, another "Flying Boxcar" brought in five other expedition members. The base camp party now totalled thirteen; the newcomers were Dr. Michel Brochu, a geographer from the Geographical Branch, Dr. Moreau S. Maxwell, an archaeologist from Michigan State University, representing the National Museum of Canada, Ian McLaren, an aquatic biologist from the Fisheries Research Board, Professor J. H. Soper, a botanist from the University of Toronto, and Dr. John Tener, a mammalogist of the Canadian Wildlife Service. During the summer of 1958, both Deane and Christie continued and extended their special studies begun in the previous year.

Luxuriant growth of grass (Alapecunus alpina) *around musk-ox skull.*

Of all the members of "Operation Hazen", Christie was probably the one who travelled furthest in the area. In addition to his journey to Clements Markham Inlet, he sledged with his assistant down the Ruggles River and Chandler Fiord to carry out geological studies in the Lady Franklin Bay area and on Judge Daly Promontory. In early July, the two men walked from Lake Hazen to Alert and back with pack dogs. These traverses, supplemented by data gathered during the DC3 flights, and on the trips to the interior icecap, enabled the geology of Northern Ellesmere Island to be described in outline for the first time.

Deane completed the study of Lake Hazen, and of the rivers draining into it. The largest fresh water lake in the Queen Elizabeth Islands, Lake Hazen has a maximum depth of 864 feet near the east end of Johns Island, about a mile south of the north shore. With the aid of an automatic depth recorder it was possible to draw a bottom profile of the lake; this showed up as a shallow, asymmetrical U-shaped depression. The origin of Lake Hazen is still in doubt. It could be due either to faulting or to glacial scour; the latter seems to be the more likely explanation.

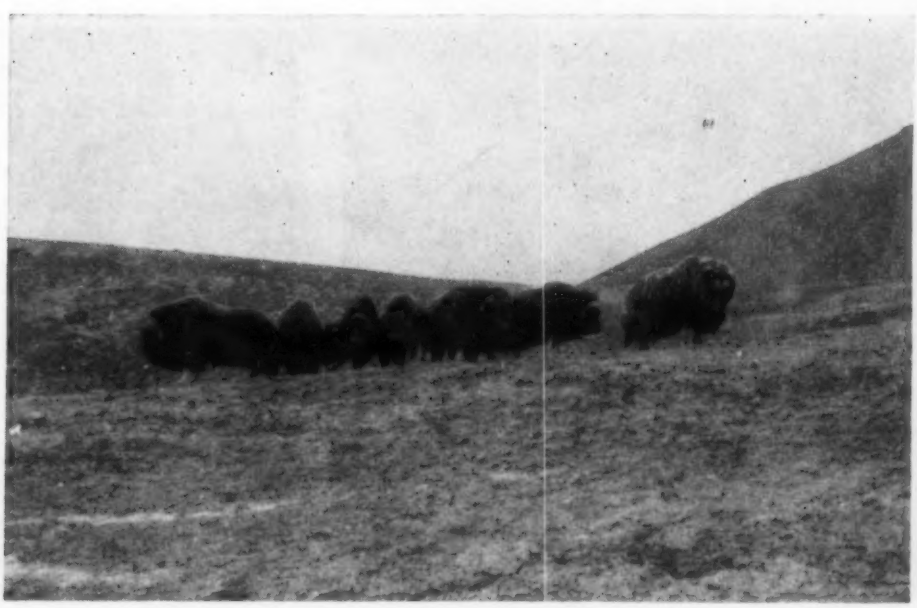
While the solid geology and the limnology of the Lake Hazen area were being examined, Smith and Brochu studied the landscape of the region. Smith studied the snouts of ten glaciers draining down from the interior ice-

cap. Of particular interest was his examination of the snout of the Henrietta Nesmith Glacier. Observations at the sides of this glacier seemed to indicate that the glacier was thinning slightly, and movement studies showed that between September 1957 and May 1958, the glacier advanced only about five feet.

Botanical evidence can also be used in the study of glaciers. It was always surprising to see flowers and other vegetation growing only a few feet away from the snouts of glaciers, and to come across Arctic poppies and purple saxifrage blooming on barren rock screes at 3,000 feet above sea level. Powell collected a complete record of temperatures below the surface near the base camp during the year, the first record of its kind obtained in the Queen Elizabeth Islands.

The depth of thawing here never exceeded three feet, and yet, even in this harsh environment, many species of plants bloomed. On a trip to the glacier camp, Powell made plant collections on the nunataks. Even here, at the extremes of an Arctic desert climate, forty-two plant species were found above 3,000 feet, and four of these grew above 4,000 feet. Powell also assisted Soper in the botanical collecting and plant studies. No less than one hundred and sixteen species of higher plants were collected during 1958; six of these were new to the flora of Ellesmere Island, twenty-one species and one subspecies represented a new "furthest north" extension for the world, and eighteen other species represented a northern range extension in Canada. Cotton-grass waving in the shallow waters around the lake, purple saxifrage and yellow and white poppies blooming on barren rock screes, and enough willow in many places to build fires with, made any field trip a pleasant experience. The rich flora of the area provided good pasture for musk-oxen, of which Tener made a special study.

An Arctic fox.



Small herd of musk-oxen, consisting of two bulls, six cows and two calves, near Lake Hazen.

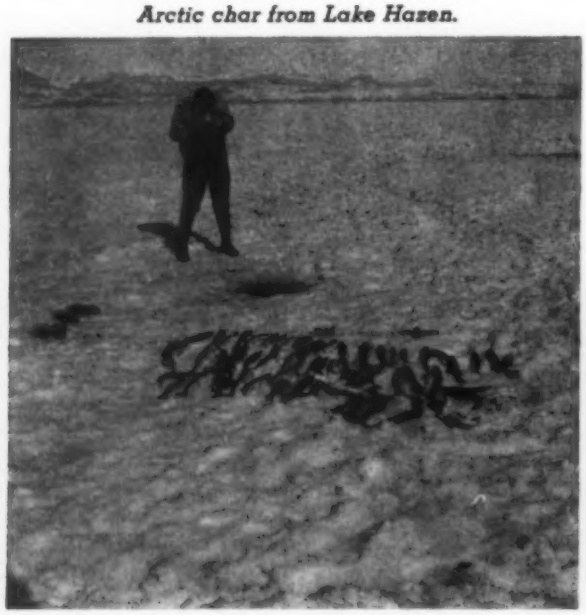
Ptarmigan in winter plumage at Lake Hazen.

Herds of these large animals, grazing on the Arctic tundra, were seen by many field parties, but they were never molested. The abundant wild life of the area included musk-oxen, wolves, foxes, lemmings, weasels, and such birds as snow geese, owls, eider ducks, ptarmigan, knots, turnstones, snow buntings, jaegars, terns and loons. During the summer of 1958, eighteen different species of birds were recorded, including Baird's sandpiper and the Lapland longspur. Also seen in 1958 were three of the Peary's caribou.

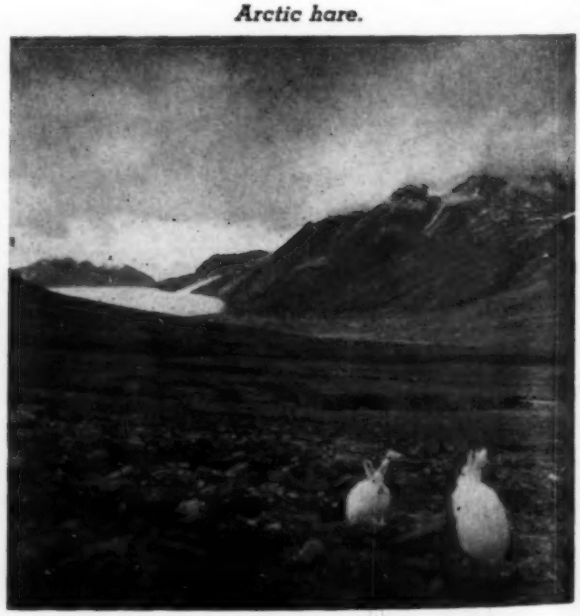
As soon as the lake opened, McLaren began his studies of the Arctic char. This fish is the only species living in the lake, and the 1958 investigation was the most northerly ever undertaken on Arctic char. Although growth is slow, and the largest specimen weighed only eight pounds, Lake Hazen has quite a large fish population. Over six hundred and fifty fish were caught in 1958; most of these served as scientific specimens and as extra delicacies for the camp table.

The Arctic char must have been a welcome addition to the diet of the early Eskimos who inhabited this remote region. It had previously been believed that the Greely Fiord—Lake Hazen—Ruggles River—Chandler Fiord route had formed a highway for Eskimos migrating in early times from Canada to Greenland. The expedition's archaeologist, Maxwell, spent a very full summer digging into the past of northern Ellesmere Island. Of all the workers in the field that year, his was the most solitary task. Searching for stone rings and remains of Eskimo houses in this rock-strewn landscape was not an easy task, but every member of the expedition who worked on the land became an enthusiastic amateur archaeologist, looking for and very often finding remains of early human occupation. Maxwell's major investigations were carried out in the Lonesome Creek area

Arctic char from Lake Hazen.



Arctic hare.



on the south side of the entrance to Conybeare Fiord. The creek was so named because it was here, near a site with forty-three distinct structures, that Maxwell spent nearly a month, alone except for a curious wolf that periodically jumped on his tent. In all, thirty-three occupation sites were examined, ranging in size from the "metropolis" of Lonesome Creek to single tent rings. In addition to the Lonesome Creek site, Maxwell worked sites in the Gilman River valley and delta, the Conybeare Fiord—Lady Franklin Bay area, the west bank of the Ruggles River, the east end of Lake Hazen, the south shore of Lake Hazen, and sites to the north of the lake.

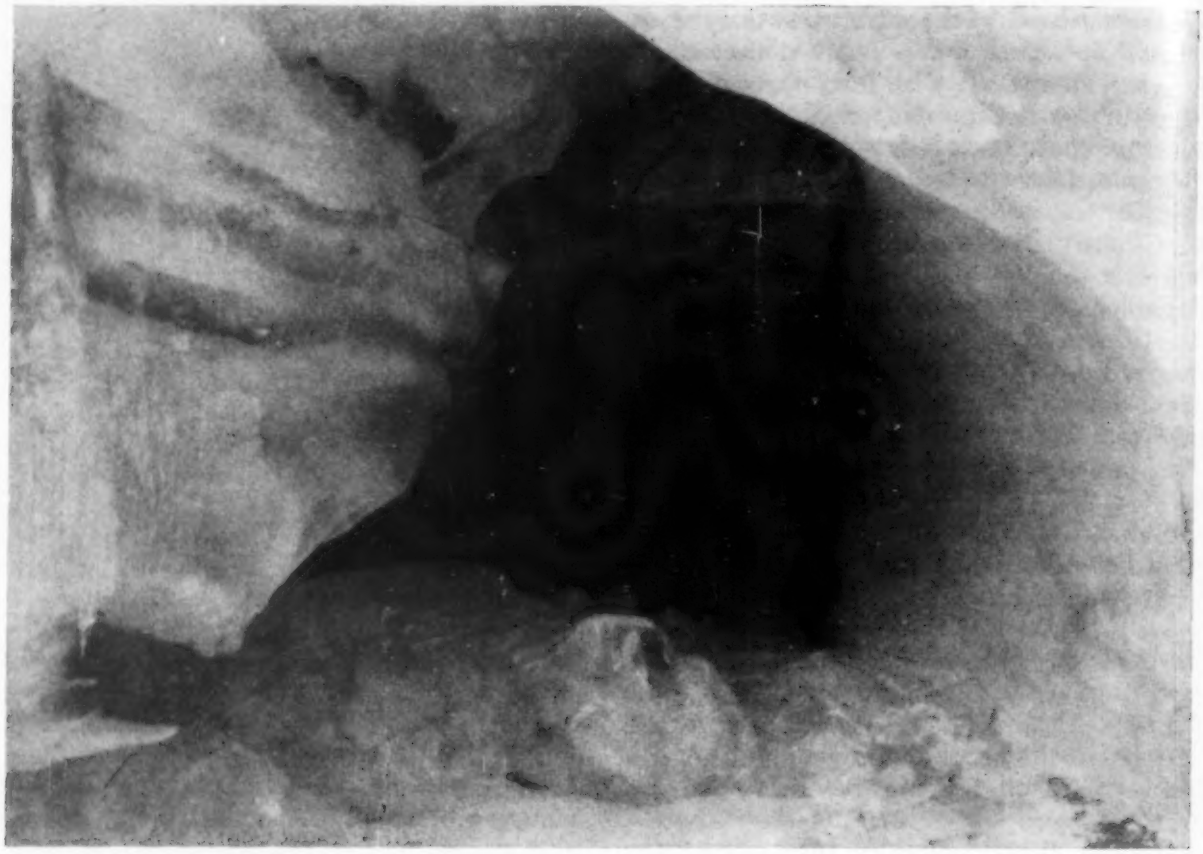
From the vast mass of material gathered, Maxwell was able to dispose of the theory that Lake Hazen had been a migration route, or the site of an extensive population in the past. Northern Ellesmere Island was probably first inhabited about a thousand years ago, and then only by intermittent parties of hunters. Although more than a hundred tent rings were discovered, only four structures were found that could be interpreted as winter houses.

During the summer of 1958, expedition members travelled hundreds of miles on foot, by snowmobile, motor toboggan, tractor, dog sledge, boat and plane. The base camp was a place of constant comings and goings, as field parties arrived and departed. Isolated tent camps sprang up as centres for archaeological, botanical, and zoological investigations. The C-119 that had brought the five scientists on May 30th left on the same day, as did the DC3 that had served us so well. With them went the "Operation Hazen" liaison officer, and Dr. Grant. On June 9th, an R.C.A.F. "North Star" landed on the lake. This visit was part of the northern tour of the Chairman of Canada's Defence Research Board; Dr. Zimmerman's party included sixteen senior Canadian government officials, senior Canadian and American officers, and civilian scientists. The group saw some of the field work being done at Lake Hazen, visited the Henrietta Nesmith Glacier, and were regaled with Arctic char. The "North Star" left on June 11th, flying over the interior icecap region, and carrying out on its way south a very welcome mail drop over the glacier camp.

A temporary tent camp at Lake Hazen base camp.

The next visitor to the base camp was Dr. Terris Moore, formerly President of the University of Alaska. In his tiny "Supercub" plane he had flown from the United States, and arrived at Lake Hazen on August 6th. His light plane was invaluable in helping to complete the field work, and in arranging the evacuation of the party. Equipped with floats, the plane was able to land on any body of water in the area. From the air it was

Sunbathers on the shore of Lake Hazen.



Inside an ice-cave on the edge of the Gilman Glacier.

The edge of the glacier.

possible for some of the scientists to finish off their summer work with an overall view of the area. Maxwell, during one flight, was able to locate and examine the distribution of Eskimo sites in the Lake Hazen area; Tener made a musk-ox survey and count; Smith and Brochu gained a new appreciation of the major landscape forms of the area; Christie flew to Ward Hunt Island to collect fossils; Deane studied the lake from the air.

The U.S.S. *Atka* had anchored at the head of Chandler Fiord on August 8th, and on the following day the evacuation of the base camp began. On July 31st the survey and gravity party had left the Gilman Glacier camp to traverse down to the base camp. From here the traverse continued across the lake, and down the Ruggles River to tide water at the head of Chandler Fiord. The north and east coast of northern Ellesmere

Island were now accurately tied together in a level and gravity survey.

Only three people remained at the glacier camp. Hattersley-Smith and Sagar left on August 2nd for a final sledge trip to the icecap, while I kept the meteorological programme going. They returned six days later, and the next few days were spent in glaciological studies on the Gilman and the nearby tributary glaciers. At ten in the evening of August 12th, I did the last weather observation; on the next day Sagar left with all the remaining pack dogs. In the Gilman Valley a helicopter picked him up, and took him to the *Atka*. While this helicopter was evacuating the base camp, we were finishing our work on the glacier, and closing the station. The *Atka* sailed on August 14th, leaving only Deane, McLaren and Tener at base camp to complete their scientific work. On the 18th, Hattersley-Smith and I struck our tent, hoisted our packs on to our backs, and headed for home in dirty weather. Camping for one night at the snout of the glacier, we reached the mouth of Mesa Creek on the following evening. Here, on August 19th, Tener and McLaren picked us up by boat and took us to base camp.

"Operation Hazen" was nearly over now, except for tidying up at base camp. The landscape now presented a different face to the one that I had seen when I had dropped out of the first plane to land on the lake, fifteen months before. The lake was open, the hills clear of snow, musk-oxen grazed on the tundra, snow geese settled on the water, and flowers carpeted the land. About noon on the 20th, an R.C.A.F. "Canso" amphibian swooped down, landed to the north of Johns Island, and taxied in to shore. We climbed aboard the plane, which soared aloft with the aid of auxiliary jets. Two hours flying took us to Thule, there to meet up with the other members of the expedition who had arrived by ship on the same day.

The operation was a memorable experience for everyone who took part. Since the expedition returned, more than fifty reports, articles, and papers have appeared on the scientific results. The spell of northern Ellesmere Island is still on all of us, and since 1958, Tener, Powell, Sagar, Hattersley-Smith and I have each returned there to continue the work begun during "Operation Hazen".

An R.C.A.F. "Canso" at Lake Hazen in August, 1958.

BIG BUSINESS—GETTING BIGGER!

75 thousand Canadian fishermen have a share in Canada's annual catch of all species of fish and shellfish. The marketed value of this 2 billion pound catch is approximately $200 million, of which about $100 million goes to the fishermen themselves.

Canada is fortunate to have such a self-perpetuating natural resource and the Department of Fisheries of Canada is working to maintain an intelligent management of these important fish stocks on which the industry depends.

The Department of Fisheries engages in the conservation and expansion of fish populations—the discovery of new fishing grounds—the development of new products—works towards the improvement of fish processing and packaging. It also inspects and promotes fishery products, and stimulates those engaged in the industry to keep abreast of technological developments.

The Department does everything possible to further the industry, and the Canadian Government searches for new markets around the world for fishery products.

DEPARTMENT OF FISHERIES
OTTAWA, CANADA
Hon. J. Angus Maclean, M.P., Minister. George R. Clark, Deputy Minister

EDITOR'S NOTE-BOOK

This month the Society is conducting a membership campaign by direct mail. We have tried to ensure that literature is not sent to our present members, but if it is received by chance would you please pass it on to a friend. Also, some of your friends who have been approached may want to know about the Society and about the *Canadian Geographical Journal*. We hope you will assist us in any way that you can since increased membership will allow us to expand our efforts and improve the Journal.

* * *

W. R. Leslie (*The Pembina Pocket*), a native of Saskatchewan, obtained his degree in agriculture, specializing in horticulture, from the University of Manitoba. He subsequently spent a year at the Central Experimental Farm in Ottawa as a graduate student, undertook some further study at the Ontario Agricultural College, and then in 1917 was made Plant Specialist in charge at the Northern Ontario Plant Breeding Station at Fort William, where he remained until 1921. In that year, he was appointed Superintendent of the Morden Experimental Station, which post he held until 1956. Mr. Leslie is now a landscape consultant and a writer of a garden column for the *Winnipeg Free Press*.

* * *

J. L. Kirwan (*Belcher Islands, N.W.T.*) is a graduate in geology from Carleton University, Ottawa, and is engaged in field work in northern Ontario at the present time. He gathered material for his article while serving as a member of the Geological Survey of Canada field party in the Belcher Islands during the summer of 1959.

* * *

Kenneth Robertson, M.B.Ch. B., F.R.C.S.Ed., (*The Outer Hebrides of Scotland Today*) was born and educated at Edinburgh, Scotland, attending Melville College and the University of Edinburgh. He qualified as a medical practitioner in 1946. After spending several years in Edinburgh, his life-long interest in the Highland area led to his settlement as

surgeon and general medical practitioner in the Outer Hebrides.

* * *

J. R. Lotz (*Operation Hazen*); for biographical sketch, see the August 1961 issue of the C.G.J.

AMONGST THE NEW BOOKS

The Discovery of the Pacific Islands
by Andrew Sharp
(Oxford University Press, Toronto
259 pp. $6.75)

The author has carried out research for many years on the early history and geography of the Pacific. During this work, it became obvious to him that many of the identifications of islands allegedly seen by various explorers were "suspect or speculative". In this book, he has sought to trace the first European or American discovery of the various Pacific Islands, or the first firm report where the possibility of previous contact arises, taking "Pacific Islands" to mean the islands of Polynesia, Micronesia and Melanesia. This he does by considering each explorer or expedition in chronological sequence, often quoting from their original records in order to identify their discoveries. Thus some of the entries are short, others are lengthy. For example, item 50, entitled John Hunter, gives a short extract from Hunter's journal and follows it by the sentence: "This was the atoll known as Stewart Island". The next item, 51, entitled William Bligh's Second Voyage, is nearly two pages in length. Often the author gives summaries of the ethnological descriptions of the discoverers, in addition to their topographical and hydrographic observations, and hence has added to the value of the book as a work of reference for those interested in the geography of the Pacific. At the same time, the author has shown that the view that the interpretations of the explorers was prejudiced and unscientific is unjustified. Indeed, "In their factual observations the plain blunt sailors of the exploration period were consistent, realistic and objective". This is important in that such observations were made at the time of first European contact. Ten maps (or photographs of maps) are judiciously chosen to elucidate parts of the text; there is a useful bibliography and an exhaustive thirty-page index.

N. L. NICHOLSON

Dr. Nicholson is Head of the Geographical Branch in the Department of Mines and Technical Surveys, Ottawa.

Indian Life in the Upper Great Lakes
by George Irving Quimby
(University of Toronto Press,
Toronto. 182 pp. $5.95)

Only rarely have archaeologists attempted the very difficult task of writing for the layman a simple, readable book on a large, complex, and incompletely known subject. Mr. Quimby, a widely experienced archaeologist, has achieved considerable success in this attempt to summarize, for "the interested lay reader and the introductory student or someone who has a general regional interest", the extensive aboriginal prehistory and ethnography of the Upper Great Lakes.

The introduction is followed by chapters on the area's geochronology and glacial history. The clarity of these chapters is enhanced by the author's warning that these matters are still subjects of much debate. He begins the archaeological story about 10,000 B.C. with the region's first occupation by Paleo-Indians, noted for their cultural adaptation to the environment and their hunting of mastodons. About 5,000 B.C., people of Boreal Archaic culture replaced the Paleo-Indians. A separate chapter is devoted to Old Copper culture, to Mr. Quimby a separate entity; to many of his colleagues, an impressive variation on the Boreal Archaic theme. The Old Copper culture, which disappeared about 1,500 B.C., is best-known for its tools and weapon blades made by cold-hammering and annealing native copper dug from mines in the Upper Great Lakes region. The author's hypothesis that Old Copper culture was related to the historic Copper Eskimo of the Coronation Gulf region will earn scant support among his colleagues.

About 500 B.C., the Boreal Archaic culture developed into Early Woodland culture. Early Woodland culture is distinguished by the presence of fired clay vessels and, in many of its variants, by the building of burial mounds for the dead. The pottery likely derived by diffusion from the taiga of Siberia; the burial mound complex probably reached the area from the Ohio and Mississippi valleys. During Middle Woodland times, people of Hopewellian culture entered the southern part of the Upper Great Lakes area bringing with them from Ohio or Illinois, the area's first agriculture involving squash, beans, and

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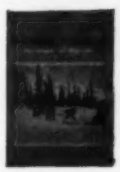

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corn. A greater diversity of cultures marks the area in Late Woodland times between A.D. 800 and 1600. Several of these interrelated regional and chronological variants are described and related to the historic tribes in the region.

Some fifty pages provide a sketch of the early historic period between 1600 and 1760, summarize the ethnography of the resident tribes (Huron, Chippewa, Ottawa, Potawatomi, Sauk, Fox, Miami, Winnebago, and Menomini), and last, comment on the breakdown of tribal culture in the period from 1760 to 1820. The advance of Old World civilization into the Upper Great Lakes region brought disaster to the tribes—a story spanning 12,000 years closed in squalid tragedy.

In general, the book's format, glossary, extensive bibliography, and abundance of illustrations deserve praise. Unfortunately no scale accompanies the photographs of artifacts and there are almost no illustrations of archaeological sites and excavations. The writing is consistently simple and clear if, at times, repetitious; it is free of pedantry, but also of literary colour and impact. That simplicity of writing, no simple achievement, is one of the book's strongest qualities although it might lead some readers to conclude that anthropology is as simple a study as its students often wish. Mr. Quimby, taking a difficult task, has produced a useful summary highly recommended to the lay reader and the beginning student.

W. E. TAYLOR

Mr. Taylor is in the Archaeology Section of the National Museum at Ottawa.

* * *

Greg's Choice
by Gregory Clark
(Ryerson Press, Toronto.
184 pp. $3.50)

The name of Gregory Clark is too well known to Canadian readers to require any recommendation. Most of us read his pleasant, friendly articles in *Weekend Magazine* and enjoy his quizzical humour, his genial way of laughing at himself, and making us laugh at ourselves, through his manner of illuminating the common things of life. But it is not only his gay and cheerful outlook that makes his books so pleasant to read. His is a mind disciplined by two world wars, and having survived the long campaigns he has earned the right to settle down to a quiet career of fishing and neighbourliness in his own lake-

(Continued on page IX)

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(*Continued from page VIII*)

side community, and he adds touches of thoughtful philosophy to his articles when occasion serves. There is recreation to be found in seeing how other folk meet the ups and downs of daily happenings; his humour is entirely unforced, and the selection that he here presents to us in *Greg's Choice* can fill in many moments of easy relaxation. For anyone who writes as regularly as Mr. Clark there is bound to be some variation in the standard of excellence and one cannot expect to find very frequently such a gem of fine workmanship as one meets in *The Terror* on page forty-three.

It is a little volume for amusement in the leisure hour and the reading public will be grateful to Mr. Clark for a book which bespeaks contentment with daily life, good will and understanding towards other folk, and a touch of thoughtfulness bred from a wide variety of human experiences. The book has no illustrations. They would indeed be rather superfluous with a pen as graphic as Mr. Clark's.

SYLVIA SEELEY

* * *

The Elements Combined
by William Kilbourn
(Clarke Irwin and Company, Limited, Toronto. 335 pp. $6.50)

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the Steel Company of Canada commissioned William Kilbourn of the History Department of McMaster University to write the history of the company.

The result, instead of a parochial paean, is an excellent historical record of the growth of Canadian industry. So closely are living standards allied to per capita steel consumption that the progress of Canadian well-being can be followed as this history portrays the growth of this steel company.

The title is taken from the ancient conception of the four elements, earth, air, fire and water all allegorically involved in the reduction of iron ore to steel.

In 1910 when the company venture was formed, uses for steel though limited were urgent. Production was mostly contained in small family affairs, some still in the hands of the founders. Max Aitkin, now Lord Beaverbrook, already a successful investment underwriter at the age of 30, conceived the idea of merging a group of the larger of these iron producers and fabricators. The consolidation could affect economics through integration of production, create a large fighting corporate entity, keep out foreign expansion in Canada and afford Beaverbrook a handsome underwriting profit. It was all brought about at a cost of Beaverbrook selling out and leaving the country, and the fledgling company being loaded with a debt, which has cautioned successive management ever since.

At that time, though the capital commitments were about equal in Montreal plants and Hamilton, Ontario ones, the geographical production emphasis shifted to the Lake Ontario area. This was natural since raw material sources of coal and ores were ideally available by water from the U.S.A. Minnesota and Pennsylvania suppliers.

Enlightened and dedicated management steered the company through its debt-heavy path diversifying and growing as Canada expanded. It avoided the tempting prospects of the railroad growth preferring to develop and serve markets which would remain after all the tracks were laid.

The outbreak of World War I found the Canadian economy in a depressed condition and the Steel Company no better. Persistent application and research succeeded in developing war orders and since that time the Company fortunes have never regressed.

Kilbourn displays these strengths and policies of the management in an excellent manner. The Company's labour relations are explained and comprehended during this period when unions were so actively organizing the nation's working force. In fact as the book is read it is difficult to place the author as a history professor. His grasp and freedom with his subject show a completely unrestricted approach and penetrating knowledge of the industry and the economy of Canada, as well as the supporting historical facts and political significances.

The expansion of the company to its present day capacity of nearly 3,000,000 tons of steel annually was achieved with many technological firsts for the industry. Its solid conservative management, always aware of the early struggle against its incorporation burdens have expanded with their own reserves though not sacrificing research or failing to supply the nation as required.

The book by far exceeds its original purpose and could be used as a text for Canadian industrial history. It is interesting, well documented and gives an intimate and frank portrayal of not only its own personnel but also of the industrial and political figures of its period.

ALAN M. MACKENZIE

Mr. Mackenzie is in the Metals and Minerals Division of the Foreign Trade Service, Department of Trade and Commerce at Ottawa.

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